PATENT ABSTRACTS OF JAPAN

(11)Publication number : 11-295762
(43)Date of publication of application : 29.10.1999

(51)Int.Cl. G02F 1/136
G02F 1/1335

(21)Application number : 10-105047
(22)Date of filing : 15.04.1998

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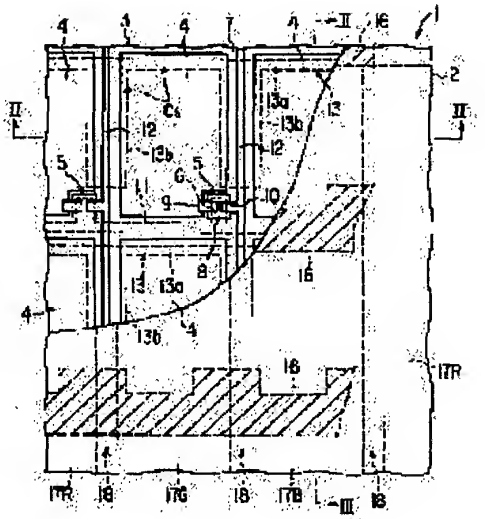
(54) LIQUID CRYSTAL DISPLAY DEVICE

(57)Abstract:
PROBLEM TO BE SOLVED: To display a color picture on a screen with sufficient brightness in the case of a reflection type display utilizing external light, and to display a color picture with sufficient contrast as well as sufficient brightness on a screen in the case of a transmission type display utilizing illuminating light from a lighting means.
SOLUTION: In a two-way liquid crystal display device in which a lighting means making illuminating light exit behind a liquid crystal display element and also reflecting external light made incident from the front is arranged, the liquid crystal element 1 is provided with picture element electrodes 3, thin film transistors(TFT) 5, gate lines 11 and data lines 12, and compensating capacitor electrodes 13 on an inner surface of a back side substrate 3, and color filters 17R, 17G, 17B an a counter electrode 20. At the same time, the compensating capacitor electrodes 13 are formed in a form having an extension part 13b facing a region between adjoining picture element electrodes, and spacing 18 corresponding to the extension parts 13b of the compensating capacitor electrodes are formed between the color filters 17R, 17G, 17B.



LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

* NOTICES *

1. This document has been translated by computer.So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] The liquid crystal display characterized by providing the following. Two or more pixel electrodes arranged in the shape of a matrix to the inside of the tooth-back side substrate of the substrates of the couple which counters on both sides of a liquid crystal layer. Two or more TFT connected to each of this pixel electrode, respectively. The gate line and data line for supplying a gate signal and a data signal to such TFT. The compensation-capacitance electrode which counters the edge of each aforementioned pixel electrode through an insulator layer, and forms a compensation capacitance between the aforementioned pixel electrodes is prepared. While the counterelectrode which counters each aforementioned pixel electrode is prepared, and the coloring film of two or more colors makes each aforementioned pixel electrode correspond to the inside of a front-face side substrate, respectively and is prepared in it at one inside of the substrates of the aforementioned couple The aforementioned compensation-capacitance electrode consists of a metal membrane with the high reflection factor of light. this compensation-capacitance electrode It is formed in the configuration which has the extension which counters an adjacent pixel inter-electrode field. The coloring film of two or more aforementioned colors is arranged so that a gap may be formed in the position corresponding to the aforementioned extension of the aforementioned compensation-capacitance electrode. The liquid crystal display element which carries out outgoing radiation ahead while the light which penetrates the gap between the aforementioned coloring films among the light which carried out incidence from the front, and is reflected by the aforementioned compensation-capacitance electrode has been a non-colored light, A lighting means to turn to the aforementioned liquid crystal display element the outdoor daylight which carries out incidence, and to reflect from the front of the aforementioned liquid crystal display element while being arranged behind the aforementioned liquid crystal display element and turning and carrying out outgoing radiation of the lighting light to the aforementioned liquid crystal display element.
[Claim 2] The aforementioned coloring film is a liquid crystal display according to claim 1 characterized by being formed so that the aforementioned whole pixel electrode which consists of a transparent electric conduction film may be covered, and setting up the gap between the aforementioned coloring films smaller than the width of face of the extension of the aforementioned compensation-capacitance electrode.
[Claim 3] The aforementioned compensation-capacitance electrode is a liquid crystal display according to claim 1 or 2 characterized by consisting of the line section which counters the end marginal part of the aforementioned pixel electrode, and an extension prolonged along with the edges-on-both-sides section of the aforementioned pixel electrode, respectively from the unilateral edge of this line section.
[Claim 4] The liquid crystal display according to claim 3 characterized by preparing the shading film corresponding to the inter-electrode field by the side of the ends of each aforementioned pixel electrode in the inside of the front-face side substrate of the aforementioned liquid crystal display element, respectively, and the aforementioned extension of the aforementioned compensation-capacitance electrode corresponding to the whole field without the aforementioned shading film.

[Translation done.]

* NOTICES *

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] This invention relates to the 2 way display type display using all of a reflected type display and a penetrated type display.
[0002]
[Description of the Prior Art] There is a 2 so-called way display type thing which performs both the reflected type display using outdoor daylight, such as the natural light and indoor light, and the penetrated type display using the lighting light from the lighting means generally called back light as a liquid crystal display.
[0003] This 2 way liquid crystal display is arranged behind a liquid crystal display element and this liquid crystal display element, and it consists of a lighting means to turn to the tooth back of the aforementioned liquid crystal display element the outdoor daylight which carries out incidence, and to reflect from the front of the aforementioned liquid crystal display element while lighting light is turned to the tooth back of the aforementioned liquid crystal display element and it carries out outgoing radiation.
[0004] Generally as the aforementioned liquid crystal display element, the thing of an active matrix method which used TFT (it is hereafter described as TFT) for the active element is used.
[0005] The liquid crystal display element of this active matrix method Two or more pixel electrodes arranged in the shape of a matrix to the inside of one substrate of the substrates of the couple which counters on both sides of a liquid crystal layer, Two or more TFT connected to each of this pixel electrode, respectively, and the gate line and data line for supplying a gate signal and a data signal to such TFT, The compensation-capacitance electrode which counters the marginal part of the aforementioned pixel electrode through an insulator layer, and forms a compensation capacitance between the aforementioned pixel electrodes is prepared, and it has the composition of having prepared the counterelectrode which counters two or more aforementioned pixel electrodes at the inside of the substrate of another side.
[0006] Furthermore, there are what displays monochrome picture, and a thing which displays a color picture in the aforementioned liquid crystal display element, with the liquid crystal display element which displays multicolor color pictures, such as a full color picture, two or more aforementioned pixel electrodes were made to correspond, respectively, and the coloring film of two or more colors is prepared in one (generally front-face side substrate) inside of the substrates of the aforementioned couple.
[0007] Generally the aforementioned coloring film is the light filter of three colors of red, green, and blue, and in order that the light filter of each color may carry out outgoing radiation of most light which penetrates each pixel field where each pixel electrode and a counterelectrode counter mutually as a coloring light, respectively, the aforementioned whole pixel electrode is formed in the wrap size.
[0008] In order that the liquid crystal display element equipped with this coloring film may abolish the leakage of the light from the circumference of each aforementioned pixel field and may display the color picture of good contrast, it is common to have prepared the shading film which the inside of a front-face side substrate is made to correspond to an each pixel inter-electrode field, and is generally called black mask to it.
[0009] Moreover, as a liquid crystal display element, many TN (Twisted Nematic) type things to which twist orientation of the molecule of the liquid crystal of a liquid crystal layer was carried out on the predetermined twist square among both substrates are adopted, and with the this TN type liquid crystal display element, after it has turned the polarizing plate to the front face of the front-face side substrate, and the tooth back of a tooth-back side substrate and they have turned the transparency shaft in the predetermined direction, respectively, it arranges.
[0010] What has arranged the transflective reflecting plate is used for the front face of the lighting panel which carries out outgoing radiation of the lighting light as the aforementioned lighting means. What is called side light type which

consists of the light source section which made the end side the plane of incidence of light at least, was made to counter the aforementioned end face of the light guide plate made into the outgoing radiation side of the light which incorporated the front face from the aforementioned end face, and this light guide plate generally, and has been arranged is used for the aforementioned lighting panel, and the aforementioned transflective reflecting plate is arranged in the front face of the aforementioned light guide plate.

[0011] An aforementioned side light type lighting panel draws the light from the light source section with a light guide plate, and it carries out outgoing radiation from the front face, and in a light guide plate, the light from the aforementioned light source section is incorporated from the end face, is drawn by the repeat of reflection of the light in the front face and tooth back of a light guide plate, and it carries out outgoing radiation from the simultaneously whole region of the front face of a light guide plate. Moreover, the aforementioned transflective reflecting plate embraces its reflection / permeability property, and makes an incident light reflect and penetrate.

[0012] The aforementioned 2 way liquid crystal display performs the reflected type display using outdoor daylight, when the outdoor daylight of sufficient luminosity is obtained, when the outdoor daylight of sufficient luminosity is not obtained, the penetrated type display using the lighting light from the aforementioned lighting means is carried out, and the light source section of the aforementioned lighting means is turned on when carrying out a penetrated type display.

[0013] At namely, the time of the reflected type display using outdoor daylight The light which carried out [light] incidence from the front of a liquid crystal display element, penetrated this liquid crystal display element and carried out incidence to the aforementioned lighting means is reflected by the aforementioned transflective reflecting plate with the reflection factor according to its reflection / permeability property. The reflected light carries out incidence to the aforementioned liquid crystal display element from the tooth back, this liquid crystal display element is penetrated, outgoing radiation is carried out ahead, and a picture is displayed by the outgoing radiation light from each of that pixel field.

[0014] Moreover, the lighting light which carries out outgoing radiation to the front face of the aforementioned lighting panel penetrates the aforementioned transflective reflecting plate with the permeability according to its reflection / permeability property, the transmitted light carries out incidence of the time of the penetrated type display using the lighting light from the aforementioned lighting means to the aforementioned liquid crystal display element from the tooth back, this liquid crystal display element is penetrated, outgoing radiation is carried out ahead, and a picture is displayed by the outgoing-radiation light from each of that pixel field.

[0015] In the case of the liquid crystal display using the liquid crystal display element which the outgoing radiation light from each pixel field of the aforementioned liquid crystal display element was made to correspond to each pixel electrode, respectively, and prepared the light filter of three colors of red, green, and blue, it is red, green, and a blue coloring light, and a full color picture is displayed by the combination of such coloring light.

[0016]

[Problem(s) to be Solved by the Invention] However, although the outgoing radiation luminous intensity from a liquid crystal display is high compared with the luminosity of the observation environment of the display at the time of the penetrated type display whose 2 way liquid crystal display which displays the conventional color picture uses the lighting light from a lighting means and the color picture of sufficient luminosity can be displayed At the time of the reflected type display using outdoor daylight, it has the problem that the outgoing radiation luminous intensity from a liquid crystal display will become extremely low, and the whole screen will become dark, compared with the luminosity of display observation environment.

[0017] When this is based on the absorption of light in the transparency path of light and the liquid crystal display element is especially equipped with the coloring film (for example, red, green, the light filter of three blue colors) the light of the visible light-pattern region which penetrates a liquid crystal display element -- inside, the light of the wavelength-range region corresponding to the color of the aforementioned coloring film penetrates the aforementioned coloring film, and it becomes coloring light, and since the light of other wavelength-range regions is absorbed by the aforementioned coloring film, compared with the intensity of an incident light, the coloring luminous intensity which carries out outgoing radiation of the liquid crystal display element becomes quite weak

[0018] And when the outdoor daylight of luminosity with the aforementioned sufficient 2 way liquid crystal display is not obtained, When display observation environment is dark, it is what performs the penetrated type display using the lighting light from the aforementioned lighting means. that is, at the time of this penetrated type display In order that the light which the brightness of the aforementioned lighting light was farther [than the luminosity of display observation environment] high, and carried out incidence from the tooth back of a liquid crystal display element may only penetrate this liquid crystal display element toward the front face, The coloring luminous intensity which penetrates a liquid crystal display element and carries out outgoing radiation to the front face once the absorption of

light by the aforementioned coloring film is is fully higher than the luminosity of display observation environment. Therefore, the color picture of sufficient luminosity can be displayed at the time of a penetrated type display.

[0019] On the other hand, in order to weaken intensity by the optical absorption in the path which the outdoor daylight which carries out incidence is a strong light according to the luminosity of display observation environment, the light penetrates a liquid crystal display element, is reflected by the lighting means in back, penetrates the aforementioned liquid crystal display element again, and carries out outgoing radiation to the front face at the time of the reflected type display using outdoor daylight, outgoing-radiation luminous intensity is weaker than the luminosity of display observation environment.

[0020] Therefore, when the aforementioned liquid crystal display element is equipped with the coloring film The intensity of the transmitted light becomes quite weak by the absorption of light by the aforementioned coloring film. moreover, at the time of a reflected type display In order that an incident light may penetrate a coloring film twice in the path which penetrates a liquid crystal display element in the direction of a tooth back, and the path penetrated in the direction of a front face, the amount of absorption by the aforementioned coloring film becomes still larger, and the coloring luminous intensity which carries out outgoing radiation becomes extremely weak compared with the luminosity of display observation environment.

[0021] Moreover, as for the liquid crystal display element equipped with the conventional coloring film, it is common to have made the inside of a front-face side substrate correspond to an each pixel inter-electrode field, and to have prepared the shading film in it, in order to display the color picture of good contrast, as mentioned above, therefore a color picture is expressed only as the outgoing radiation light from each pixel field.

[0022] Therefore, although the color picture of sufficient luminosity can be displayed at the time of the penetrated type display whose 2 way liquid crystal display which displays the conventional color picture uses the lighting light from a lighting means, it is dark in the whole screen at the time of the reflected type display using outdoor daylight.

[0023] Color picture with the sufficient luminosity of a screen is displayed at the time of the reflected type display whose invention of this uses outdoor daylight, and a luminosity and contrast are aimed at offering the 2 way display type liquid crystal display which can display sufficient color picture at the time of the penetrated type display using the lighting light from a lighting means.

[0024]

[Means for Solving the Problem] Two or more pixel electrodes which arrange the liquid crystal display of this invention in the shape of a matrix to the inside of the tooth-back side substrate of the substrates of the couple which counters on both sides of a liquid crystal layer, Two or more TFT connected to each of this pixel electrode, respectively (TFT), The gate line and data line for supplying a gate signal and a data signal to such TFT, The compensation-capacitance electrode which counters the marginal part of each aforementioned pixel electrode through an insulator layer, and forms a compensation capacitance between the aforementioned pixel electrodes is prepared. While the counterelectrode which counters each aforementioned pixel electrode is prepared, and the coloring film of two or more colors makes each aforementioned pixel electrode correspond to the inside of a front-face side substrate, respectively and is prepared in it at one inside of the substrates of the aforementioned couple The aforementioned compensation-capacitance electrode consists of a metal membrane with the high reflection factor of light. this compensation-capacitance electrode It is formed in the configuration which has the extension which counters an adjacent pixel inter-electrode field. The coloring film of two or more aforementioned colors is arranged so that a gap may be formed in the position corresponding to the aforementioned extension of the aforementioned compensation-capacitance electrode. The liquid crystal display element which carries out outgoing radiation ahead while the light which penetrates the gap between the aforementioned coloring films among the light which carried out incidence from the front, and is reflected by the aforementioned compensation-capacitance electrode has been a non-colored light, It is arranged behind the aforementioned liquid crystal display element, and while turning and carrying out outgoing radiation of the lighting light to the aforementioned liquid crystal display element, it is characterized by having a lighting means to turn to the aforementioned liquid crystal display element the outdoor daylight which carries out incidence, and to reflect from the front of the aforementioned liquid crystal display element.

[0025] This liquid crystal display performs the reflected type display using outdoor daylight, when the outdoor daylight of sufficient luminosity is obtained, and when the outdoor daylight of sufficient luminosity is not obtained, it performs the penetrated type display using the lighting light from the aforementioned lighting means.

[0026] This liquid crystal display consists of a metal membrane with the high compensation-capacitance electrode [which was prepared in the inside of the tooth-back side substrate of a liquid crystal display element] reflection factor of light. Since this compensation-capacitance electrode is formed in the configuration which has the extension which counters an adjacent pixel inter-electrode field, at the time of the reflected type display using outdoor daylight The compensation-capacitance section which the aforementioned compensation-capacitance electrode of each pixel field

where each pixel electrode and a counterelectrode counter mutually counters, The light which carried out incidence to the field to which the adjacent pixel inter-electrode aforementioned compensation-capacitance electrode counters Outgoing radiation of the light which was reflected by the aforementioned compensation-capacitance electrode in the inside of the tooth-back side substrate of a liquid crystal display element, and carried out outgoing radiation to the front face of a liquid crystal display element and which carried out incidence to other fields is carried out to the tooth back of the aforementioned liquid crystal display element, and it is reflected by the lighting means in back, and it penetrates the aforementioned liquid crystal display element again, and it carries out outgoing radiation to the front face.

[0027] Furthermore, in order that the aforementioned liquid crystal display element may form the gap corresponding to the extension of the aforementioned compensation-capacitance electrode between the coloring films of two or more colors which correspond to each pixel electrode which consists of a transparent electric conduction film, respectively, The light which carried out incidence to each pixel field among the light which carried out incidence to the liquid crystal display element penetrates a coloring film, it becomes coloring light, and the light which carried out incidence to the gap between the aforementioned coloring films is not colored.

[0028] That is, a coloring film and a liquid crystal layer are penetrated, it is reflected by the aforementioned compensation-capacitance electrode, and the light which carried out incidence to the aforementioned compensation-capacitance section among the light which carried out incidence to each pixel field of a liquid crystal display element penetrates the aforementioned liquid crystal layer and a coloring film again, and carries out outgoing radiation of the time of a reflected type display to the front face of a liquid crystal display element.

[0029] Moreover, it penetrates a coloring film and a liquid crystal layer, and they carry out outgoing radiation to the tooth back of a liquid crystal display element, and it is reflected by the aforementioned lighting means and incidence of the light which carried out incidence to fields other than the compensation-capacitance section of the aforementioned pixel fields is carried out to the aforementioned liquid crystal display element from the tooth back, and the light penetrates a liquid crystal layer and a coloring film, and carries out outgoing radiation to the front face of a liquid crystal display element.

[0030] Moreover, in order that the light which carried out incidence to the field between each adjacent pixel field, i.e., the gap between the aforementioned coloring films, may not penetrate a coloring film, it penetrates a liquid crystal layer with a non-colored light, and it is reflected by the aforementioned compensation-capacitance electrode, and it penetrates the aforementioned liquid crystal layer again, and it carries out outgoing radiation to the front face of a liquid crystal display element.

[0031] And the outgoing radiation light from each aforementioned pixel field among such outgoing radiation light Since it is the light which penetrated the aforementioned coloring film twice in the path which penetrates a liquid crystal display element in the direction of a tooth back, and the path penetrated in the direction of a front face, although it is a strong weak coloring light which received two absorption by the coloring film compared with the intensity of the outdoor daylight which carried out incidence Since it is a non-colored light which does not receive the absorption of light by the aforementioned coloring film at all, if the outgoing radiation light from the field corresponding to the gap between the aforementioned coloring films between each pixel field is compared with the aforementioned coloring light, it will be light with high enough intensity.

[0032] And without carrying out outgoing radiation to the tooth-back side of a liquid crystal display element, the outgoing radiation light which is not colored [this] is the light reflected by the aforementioned compensation-capacitance electrode in the inside of a tooth-back side substrate, therefore is a light with more high intensity which does not receive at all the absorption of light in the path which carries out outgoing radiation to the tooth back of a liquid crystal display element, and it is reflected by the aforementioned lighting means and carries out incidence to the aforementioned liquid crystal display element from the tooth back.

[0033] For this reason, although the coloring light which carries out outgoing radiation of the time of the reflected type display using outdoor daylight from each pixel field of the aforementioned liquid crystal display element is a strong taper Since a non-colored light with high enough intensity carries out outgoing radiation rather than the aforementioned coloring light from the field corresponding to the gap between the coloring films between each pixel field, the luminosity of the whole screen can be compensated by this non-colored light, and the luminosity of a screen can display sufficient color picture.

[0034] On the other hand, the lighting light from the aforementioned lighting means at the time of the penetrated type display using outdoor daylight The compensation-capacitance section of each aforementioned pixel field among the aforementioned lighting light which carries out incidence to a liquid crystal display element from the tooth back, The light which carried out incidence to the portion which the aforementioned compensation-capacitance electrode of the fields between each adjacent pixel field has countered is interrupted by the aforementioned compensation-capacitance electrode in the inside of a tooth-back side substrate, and only the light which carried out incidence to other fields

carries out incidence to a liquid crystal layer. And the light which carried out incidence to the liquid crystal layer penetrates the aforementioned coloring film, and turns into coloring light, and the coloring light carries out outgoing radiation to the front face of a liquid crystal display element.

[0035] At the time of this penetrated type display, the brightness of the aforementioned lighting light is high, and in order that the light which carried out incidence from the tooth back of a liquid crystal display element may only penetrate this liquid crystal display element toward the front face, the coloring luminous intensity which the absorption of light by the aforementioned coloring film is only once, therefore carries out outgoing radiation is high enough.

[0036] And since the light which carried out incidence to the compensation-capacitance section formed by the marginal part of each aforementioned pixel electrode, the aforementioned compensation-capacitance electrode, and the insulator layer in the meantime and the portion which the adjacent pixel inter-electrode aforementioned compensation-capacitance electrode has countered is interrupted by the aforementioned compensation-capacitance electrode, the leakage of the light from the circumference of each pixel field is almost lost at the time of a penetrated type display, therefore it can display sufficient color picture also for a luminosity and contrast.

[0037]

[Embodiments of the Invention] As mentioned above, while this invention turns lighting light to the aforementioned liquid crystal display element and carries out outgoing radiation behind a liquid crystal display element In 2 way liquid crystal display which has arranged a lighting means to turn to the aforementioned liquid crystal display element the outdoor daylight which carries out incidence, and to reflect from the front of the aforementioned liquid crystal display element While being prepared in two or more pixel electrodes, TFT, a gate line and a data line, and compensation-capacitance electrodes by the inside of the tooth-back side substrate and preparing a counterelectrode in it at the inside of a front-face side substrate, the aforementioned liquid crystal display element While the coloring film of two or more colors makes each aforementioned pixel electrode correspond, respectively and is prepared in one inside of the substrates of the aforementioned couple The aforementioned compensation-capacitance electrode consists of a metal membrane with the high reflection factor of light, and it is formed in the configuration which has the extension to which this compensation-capacitance electrode counters an adjacent pixel inter-electrode field, and between the coloring films of two or more aforementioned colors corresponding to each aforementioned pixel electrode, respectively By considering as the composition which carries out outgoing radiation ahead while the light which the gap corresponding to the aforementioned extension of the aforementioned compensation-capacitance electrode is formed, penetrates the gap between the aforementioned coloring films among the light which carried out incidence from the front, and is reflected by the aforementioned compensation-capacitance electrode has been a non-colored light Color picture with the sufficient luminosity of a screen is displayed at the time of the reflected type display using outdoor daylight, and it enables it to display color picture also with sufficient luminosity and contrast at the time of the penetrated type display using the lighting light from a lighting means.

[0038] As for the aforementioned coloring film, in the liquid crystal display of this invention, it is desirable to form so that the aforementioned whole pixel electrode may be covered, and to set up the gap between the aforementioned coloring films smaller than the width of face of the aforementioned extension of the aforementioned compensation-capacitance electrode.

[0039] Thus, if it forms so that the whole pixel electrode which consists the aforementioned coloring film of a transparent electric conduction film may be covered, since all the outgoing radiation light from the pixel field where a pixel electrode and a counterelectrode counter mutually will turn into coloring light, The chromaticity of the color pixel displayed with the outgoing radiation light from the aforementioned pixel field is fully securable, and if the gap between the aforementioned coloring films is smaller than the width of face of the extension of the aforementioned compensation-capacitance electrode Since light does not leak from between the aforementioned compensation-capacitance electrode and coloring films, contrast in the aforementioned penetrated type display can be improved more.

[0040] Moreover, as for the aforementioned compensation-capacitance electrode, it is desirable to form in the configuration which consists of the line section which counters the end edge of the aforementioned pixel electrode, and an extension prolonged along with the edges-on-both-sides section of the aforementioned pixel electrode, respectively from the unilateral edge of this line section, and to make the aforementioned extension counter the pixel inter-electrode field which adjoins each other the account of before.

[0041] If the aforementioned compensation-capacitance electrode is formed in such a configuration, while being able to carry out outgoing radiation of the non-colored light from the both sides of the aforementioned pixel field at least and being able to make a screen bright more at the time of a reflected type display, the leakage of the light from the both sides of the aforementioned pixel field can be abolished at least at the time of a penetrated type display, and it can obtain a good conte lath. In addition, even if it forms the aforementioned compensation-capacitance electrode apart

from the gate line for supplying a gate signal to TFT, it is good also as an electrode of the aforementioned gate line and one.

[0042] Furthermore, it sets to the liquid crystal display of this invention. The shading film corresponding to the inter-electrode field by the side of the ends of each aforementioned pixel electrode is prepared in the inside of the front-face side substrate of the aforementioned liquid crystal display element, respectively. It is desirable, and making the aforementioned extension of the aforementioned compensation-capacitance electrode correspond to the whole field without the aforementioned shading film can abolish nearly completely such composition, then the leakage of the light from the circumference of each pixel field, and it can make contrast in a penetrated type display higher.

[0043]

[Example] Some front view of the liquid crystal display element which drawing 1 - drawing 5 show the 1st example of this invention, and used drawing 1 with the liquid crystal display of this example, the cross section of the liquid crystal display with which drawing 2 meets the II-II line of drawing 1 , and drawing 3 are drawing 1 . III-III It is the cross section of the liquid crystal display which meets a line.

[0044] The liquid crystal display of this example consists of a liquid crystal display element 1 which displays a color picture, and a lighting means 30 which has the reflex function of the light arranged behind this liquid crystal display element 1, as shown in drawing 2 and drawing 3 .

[0045] As the aforementioned liquid crystal display element 1 uses TFT for an active element and shows it to drawing 1 - drawing 3 To the inside of the tooth-back side substrate 3, among the substrates (transparent substrate which consists of glass etc.) 2 and 3 of the couple which counters on both sides of the liquid crystal layer 22 The pixel electrode 4 which consists of two or more transparent electric conduction films arranged in the shape of a matrix, Two or more TFT5 connected to each of this pixel electrode 4, respectively, the gate line 11 for supplying a gate signal and a data signal to such TFT5 and a data line 12, and the compensation-capacitance electrode 13 which forms a compensation capacitance between each aforementioned pixel electrode 4 are formed.

[0046] In addition, the liquid crystal display element 1 used in this example is the so-called thing of the grid-like array type which arranged each aforementioned pixel electrode 4 in in the shape of a straight line, respectively in the line writing direction (longitudinal direction of a screen), and the direction of a train (the vertical direction of a screen), and arranged it in them.

[0047] The gate electrode 6 formed on the tooth-back side substrate 3 as the above TFT 5 was shown in drawing 1 , The i-type-semiconductor film 8 which this gate electrode 6 was made to counter with the aforementioned gate electrode 6 on the wrap gate insulator layer 7 and this gate insulator layer 7, and was formed, It consists of the source electrode 9 and the drain electrode 10 which were formed through the n-type-semiconductor film (not shown) on the both-sides section of this i-type-semiconductor film 8.

[0048] The aforementioned gate line 11 is made to meet the unilateral of each pixel electrode line, respectively, and is wired, and the gate electrode 6 of TFT5 of each line is formed in the gate line 11 corresponding to the line at one. In addition, the gate insulator layer (transparent membrane) 7 of the above TFT 5 is formed over the whole simultaneously surface of the aforementioned substrate 3, and the aforementioned gate line 11 is covered by the gate insulator layer 7 except for the terminal area.

[0049] Moreover, the aforementioned data line 12 makes the unilateral of each pixel electrode train meet on the aforementioned gate insulator layer 7, respectively, and is wired, and the drain electrode 10 of TFT5 of each train is connected with the data line 12 corresponding to the train.

[0050] in addition, the contact which the aforementioned data line 12 covered TFT5 by the insulator layer, wired on it, and was prepared in the aforementioned insulator layer although the data line 12 was wired on the gate insulator layer 7 and the drain electrode 10 of TFT5 of each train was formed in the data line 12 corresponding to the train in this example at one, respectively -- you may connect with the drain electrode 10 of the above TFT 5 in a hole

[0051] And the aforementioned pixel electrode 4 is formed on the aforementioned gate insulator layer 7, and these pixel electrodes 4 are connected to the source electrode 9 of TFT5 which corresponds in the edge of the unilateral edge.

[0052] Moreover, the aforementioned compensation-capacitance electrode 13 is made to correspond on the aforementioned substrate 3 at each pixel electrode line, respectively, it is formed in the configuration which counters the marginal part of each pixel electrode 4 of the line, respectively, and the compensation capacitance (storage capacitor) Cs for compensating change of the potential of the pixel electrode 4 of a non-selection period by the marginal part of this compensation-capacitance electrode 13 and the aforementioned pixel electrode 4 and the gate insulator layer 7 in the meantime is formed.

[0053] The aforementioned compensation-capacitance electrode 13 consists of line section 13a which counters the end marginal part of the aforementioned pixel electrode 4, and extension 13b prolonged along with the edges-on-both-sides

section of the aforementioned pixel electrode 4, respectively from the unilateral edge of this line section 13a, therefore the aforementioned compensation capacitance Cs corresponds to three marginal parts of the end marginal part of each pixel electrode 4, and the edges-on-both-sides section.

[0054] With the aforementioned pixel electrode's 4 TFT connection side, the aforementioned line section 13a of this compensation-capacitance electrode 13 makes the edge section of an opposite side counter, and is formed in parallel with the above-mentioned gate wiring 10.

[0055] moreover, the field of the length of most fields between the pixel electrode 4 with which the aforementioned extension 13b is formed in the width of face which counters the side edge section of each of the pixel electrodes 4 and 4 which the edges-on-both-sides section adjoins in a line writing direction covering the length which reaches near the edge by the side of TFT connection of the aforementioned pixel electrode 4 therefore which this extension 13b adjoins the account of before, and 4 -- the -- full over opposite is carried out

[0056] The capacity wiring 13 and the data wiring 12 are all low resistance, and are formed by the metal (for example, aluminum system alloy) film with the high reflection factor of light, and the aforementioned gate wiring 11 is formed by the same metal membrane as the aforementioned capacity wiring 13. In addition, in order to make high isolation voltage between the pixel electrodes 4 and the data wiring 12 which are formed on the gate insulator layer 7, anodizing of the aforementioned gate wiring 11 and the capacity wiring 13 is carried out in the front face.

[0057] Furthermore, although omitted in drawing 1 , as shown in the inside of the aforementioned tooth-back side substrate 3 at drawing 2 and drawing 3 , the transparent overcoat insulator layer 14 which covers the above TFT 5 and the data wiring 12 is formed, and the orientation film 15 is formed over the whole array field of the pixel electrode 4 on it.

[0058] On the other hand, the shading film 16 corresponding to the field between the pixel electrode 4 which adjoins each other in the inter-electrode field of a train, i.e., direction, of the ends side of each aforementioned pixel electrode 4, and 4 is formed in the inside of the substrate 2 by the side of a front face, respectively. In addition, in drawing 1 , in order to make the shading film 16 easy to distinguish, the parallel slash is given to the shading film portion.

[0059] It consists of a metal membrane of dark color systems, such as chromium, this shading film 16 is formed in the configuration which counters the field between the pixel electrode 4 which adjoins each other in the aforementioned train direction, and 4, and the TFT5 aforementioned whole portion, and the aforementioned shading film 16 corresponds to the whole field without extension 13b of the 16 aforementioned shading film of the aforementioned compensation-capacitance electrode 13 prepared in the inside of the aforementioned tooth-back side substrate 3.

[0060] In this example, the aforementioned shading film 16 in addition, the unilateral marginal part (it sets to drawing 1 and is the upper-limb section) In the aforementioned train direction, while adjoins each other and the edge section by the side of TFT connection of the pixel electrode 4 is countered. It forms in the width of face to which the other side edge section (it sets to drawing 1 and is the margo-inferior section) counters the unilateral section (flank by the side of the edge of the pixel electrode 4) of line section 13a of the aforementioned compensation-capacitance electrode 13 which counters the edge section of an opposite side with a pixel electrode's 4 of another side TFT connection side. Therefore, the other flanks (flank of the central site of the pixel electrode 4) of line section 13a of the aforementioned compensation-capacitance electrode 13 are not covered by the aforementioned shading film 16.

[0061] Moreover, the light filters 17R, 17G, and 17B of three colors of the coloring film of two or more colors with which transmitted wave length bands differ, for example, red, green, and blue make the aforementioned pixel electrode 4 correspond to the inside of this front-face side substrate 2, respectively, and are prepared in it.

[0062] These light filters 17R, 17G, and 17B are the stripe-like filters corresponding to all the pixel electrodes 4 of each pixel electrode train, are arranged in by turns in order of red filter 17R, green filter 17G, and blue filter 17B, and are formed.

[0063] The aforementioned light filters 17R, 17G, and 17B are made to correspond to each pixel electrode train, respectively, and are prepared, and the gap 18 corresponding to extension 13b which counters the pixel electrode 4 of the aforementioned compensation-capacitance electrode 13 and the field between four among these light filters 17R, 17G, and 17B is formed.

[0064] In addition, it is slightly formed broadly rather than the width of face of the aforementioned pixel electrode 4, and the gap 18 between these light filters 17R, 17G, and 17B is about 4 micrometers or more, and is set as width of face smaller than the width of face of extension 13b of the aforementioned compensation-capacitance electrode 13 so that the aforementioned light filters 17R, 17G, and 17B may cover the whole pixel electrode 4 of each pixel electrode train.

[0065] Moreover, the aforementioned light filters 17R, 17G, and 17B are covered by the transparent protection insulator layer 19 including the gap 18 in the meantime, the transparent counterelectrode 20 of the shape of an one-sheet film which counters all the aforementioned pixel electrodes 4 is formed on this protection insulator layer 19, and

the orientation film 21 is further formed on it. In addition, the aforementioned protection insulator layer 19 can be excluded by choosing the quality of the material of light filters 17R, 17G, and 17B proper.
[0066] And the above-mentioned front-face side substrate 2 and the tooth-back side substrate 3 are joined through the frame-like sealant which is not illustrated in the periphery section, and the liquid crystal layer 22 is formed in the field surrounded by both [these] the substrates 2 and the aforementioned sealant between three.
[0067] The aforementioned orientation films 15 and 21 prepared in the inside of the substrates 2 and 3 of the above-mentioned couple moreover, respectively Orientation processing is carried out by carrying out rubbing of the film surface in the predetermined direction. the liquid crystal molecule of both the substrates 2 and the liquid crystal layer 22 between three The direction [near each substrate 2 and 3] of orientation is regulated with the orientation film 21 of the front-face side substrate 2, and the orientation film 15 of the tooth-back side substrate 3, and orientation is carried out in the state of predetermined orientation between both the substrates 2 and 3.
[0068] Furthermore, polarizing plates 23 and 24 are arranged at the superficies of the substrates 2 and 3 of the above-mentioned couple, respectively, and these polarizing plates 23 and 24 are formed where each transparency shaft is turned in the predetermined direction.
[0069] In addition, this liquid crystal display element 1 is a TN type thing, and twist orientation of the aforementioned liquid crystal molecule is carried out on a predetermined twist square (for example, about 90 degrees) between both the substrates 2 and 3, and the aforementioned polarizing plates 23 and 24 make the transparency shaft of it that intersect perpendicularly mostly mutually, or are mostly prepared by making it parallel.
[0070] Moreover, the direction [near the twist angle of the aforementioned liquid crystal molecule, and the front-face side substrate 2] of orientation and the transparency shaft orientation of the front-face side polarizing plate 23 When it is in the state (state which is changing orientation into the early twist orientation state where the liquid crystal molecule lodged most to the 2 or 3rd page of a substrate) where drive electric field are not impressed to the liquid crystal layer 22, It is set up so that the permeability of the light which it is reflected by the aforementioned compensation-capacitance electrode 13 in the inside of the tooth-back side substrate 3 of the light which carried out incidence from the front of the liquid crystal display element 1, and carries out outgoing radiation to the front face of the liquid crystal display element 1 may serve as the maximum mostly.
[0071] Next, if the lighting means 30 arranged behind the aforementioned liquid crystal display element 1 is explained, the lighting means 30 used in this example will arrange the transflective reflecting plate 32 in the front face of the lighting panel 31 called side light type, as shown in drawing 2 and drawing 3 .
[0072] That is, it consists of light guide plate 31a which the aforementioned lighting panel 31 made the end side the plane of incidence of light at least, and was made into the outgoing radiation side of the light which incorporated the front face from the aforementioned end face, and the light source section (not shown) which was made to counter the aforementioned end face of this light guide plate, and has been arranged, and the aforementioned transflective reflecting plate 32 is arranged in the front face of the aforementioned light guide plate 31a.
[0073] In addition, generally the plate-like transparent board which consists of an acrylic resin etc. is used for aforementioned light guide plate 31a, and the straight pipe-like fluorescent lamp, the LED array which aligned two or more Light Emitting Diodes (light emitting diode) are used for the aforementioned light source section.
[0074] The aforementioned lighting panel 31 draws the light from the light source section which is not illustrated by the aforementioned light guide plate 31a, outgoing radiation of it is carried out from the front face, incorporates the light from the aforementioned light source section from the end face in light guide plate 31a, leads the light to drawing 2 like the path shown as the solid line by the repeat of reflection in the front face and tooth back of light guide plate 31a, and it carries out outgoing radiation from the simultaneously whole region of the front face of a light guide plate. Moreover, the aforementioned transflective reflecting plate 32 embraces its reflection / permeability property, and makes an incident light reflect and penetrate.
[0075] This liquid crystal display performs the reflected type display using outdoor daylight, when the outdoor daylight of sufficient luminosity is obtained, when the outdoor daylight of sufficient luminosity is not obtained, the penetrated type display using the lighting light from the aforementioned lighting means 30 is performed, and the light source section of the aforementioned lighting means 30 is turned on when carrying out a penetrated type display.
[0076] When the reflected type display using outdoor daylight is explained, first, at this time The outdoor daylight which carries out incidence to the liquid crystal display element 1 from the front has the light of the polarization component which met the absorption shaft with the front-face side polarizing plate 23 absorbed. It becomes the linearly polarized light in alignment with the transparency shaft of this front-face side polarizing plate 23. The inside of the light, The light which carried out incidence to the shading film 16 which is made to counter the field between the pixel electrode 4 which adjoins the inside of the front-face side substrate 2 in the direction of a train, and 4, and the TFT5 whole portion, and is prepared is interrupted with this shading film 16, and the light which carried out incidence to the

field without the aforementioned shading film 16 carries out incidence to the liquid crystal layer 22.

[0077] And in this liquid crystal display, the aforementioned compensation-capacitance electrode 13 prepared in the inside of the tooth-back side substrate 3 of the aforementioned liquid crystal display element 1 consists of a metal membrane with the high reflection factor of light. Since this compensation-capacitance electrode 13 is formed in the pixel electrode 4 which adjoins each other in a line writing direction, and the configuration which has extension 13b which counters the field between four, at the time of a reflected type display The compensation-capacitance Cs section which the aforementioned compensation-capacitance electrode 13 of each pixel field where each pixel electrode 4 and a counterelectrode 20 counter mutually counters, The light which carried out incidence to the field to which the pixel electrode 4 which adjoins each other in a line writing direction, and the aforementioned compensation-capacitance electrode 13 between four counter like the paths L1 and L2 shown in drawing 2 with the dashed line The light which was reflected by the aforementioned compensation-capacitance electrode 13 in the inside of the tooth-back side substrate 3 of the liquid crystal display element 1, and carried out outgoing radiation to the front face of the liquid crystal display element 1 and which carried out incidence to other fields Like the path L3 shown in drawing 2 with the dashed line, outgoing radiation is carried out to the tooth back of the liquid crystal display element 1, it is reflected by the transflective reflecting plate 32 of the front face of the lighting means 30 in back, the aforementioned liquid crystal display element 1 is penetrated again, and outgoing radiation is carried out to the front face.

[0078] Furthermore, in order that the aforementioned liquid crystal display element 1 may form the gap 18 corresponding to extension 13b of the compensation-capacitance electrode 13 among the light filters 17R, 17G, and 17B of the red corresponding to each pixel electrode 4, green, and blue, respectively, The light which carried out incidence to each pixel field among the light which carried out incidence to the liquid crystal display element 1 penetrates light filters 17R, 17G, and 17B, it becomes red, green, and a blue coloring light, and the light which carried out incidence to the gap 18 between the aforementioned light filters 17R, 17G, and 17B is not colored.

[0079] Namely, the inside of the light which carried out incidence of the time of a reflected type display to each pixel field of the liquid crystal display element 1, Penetrate light filters 17R, 17G, and 17B and the liquid crystal layer 22, and it is reflected by the compensation-capacitance electrode 13 and the light which carried out incidence to the compensation-capacitance Cs section penetrates the aforementioned liquid crystal layer 22 and light filters 17R, 17G, and 17B again. The light of the polarization component in alignment with the transparency shaft of the front-face side polarizing plate 23 of them penetrates this polarizing plate 23, and carries out outgoing radiation to the front face of the liquid crystal display element 1.

[0080] Moreover, the light which carried out incidence to fields other than the compensation-capacitance Cs section of the aforementioned pixel fields Penetrate light filters 17R, 17G, and 17B and the liquid crystal layer 22, and incidence is carried out to the tooth-back side polarizing plate 24. The light of the polarization component in alignment with the transparency shaft of the aforementioned tooth-back side polarizing plate 24 of them Penetrate this polarizing plate 24 and carry out outgoing radiation to the tooth back of the liquid crystal display element 1, and it is reflected by the transflective reflecting plate 32 of the front face of the aforementioned lighting means 30, and the light carries out incidence to the aforementioned liquid crystal display element 1 from the tooth back. The aforementioned tooth-back side polarizing plate 24, the liquid crystal layer 22, light filters 17R, 17G, and 17B, and the front-face side polarizing plate 23 are penetrated in order, and outgoing radiation is carried out to the front face of the liquid crystal display element 1.

[0081] Moreover, the light which carried out incidence to the field 18 between each pixel field which adjoins each other in a line writing direction, i.e., the gap between light filters 17R, 17G, and 17B In order not to penetrate light filters 17R, 17G, and 17B, penetrate the liquid crystal layer 22 with a non-colored light, and are reflected by the compensation-capacitance electrode 13, and the aforementioned liquid crystal layer 22 is penetrated again. The light of the polarization component in alignment with the transparency shaft of the front-face side polarizing plate 23 of them penetrates this polarizing plate 23, and carries out outgoing radiation to the front face of the liquid crystal display element 1.

[0082] In addition, in the aforementioned liquid crystal display element 1, although the data line 12 passes along the extension 13b top of the aforementioned compensation-capacitance electrode 13, since this data line 12 consists of a metal membrane with the high reflection factor of light, the light which carried out incidence to the data line 12 aforementioned portion is reflected by this data line 12.

[0083] Moreover, since light filters 17R, 17G, and 17B are slightly formed broadly rather than the width of face of the pixel electrode 4 in this example, The light which carried out incidence to the portion corresponding to the edge of the aforementioned light filters 17R, 17G, and 17B of the fields between each aforementioned pixel field Penetrate light filters 17R, 17G, and 17B and the liquid crystal layer 22, and it is reflected by the compensation-capacitance electrode 13 and the aforementioned liquid crystal layer 22 and light filters 17R, 17G, and 17B are penetrated again. The light of

the polarization component in alignment with the transparency shaft of the front-face side polarizing plate 23 of them penetrates this polarizing plate 23, and carries out outgoing radiation to the front face of the liquid crystal display element 1.

[0084] And among such outgoing radiation light, the permeability of the outgoing radiation light from each pixel field changes according to change of the orientation state of the liquid crystal molecule by the drive electric field impressed between the pixel electrode 4 and a counterelectrode 20, the red and green which carry out outgoing radiation from each pixel field, and blue coloring luminous intensity change by that cause, and a full color picture is displayed by the combination of such coloring light.

[0085] However, since the outgoing radiation light from each aforementioned pixel field is the light which penetrated the aforementioned light filters 17R, 17G, and 17B twice in the path (outward trip) which penetrates the liquid crystal display element 1 in the direction of a tooth back, and the path (return trip) penetrated in the direction of a front face, it is a weak coloring light of the absorbed intensity of 2 times by light filters 17R, 17G, and 17B compared with the intensity of the outdoor daylight which carried out incidence.

[0086] and in fields other than the compensation-capacitance Cs section of the aforementioned pixel fields By the time the light which carried out incidence to the liquid crystal display element 1 from the front carries out outgoing radiation to the front face of the liquid crystal display element 1 again, in order to penetrate the front-face side polarizing plate 23 and the tooth-back side polarizing plate 24 by a unit of 2 times, respectively, two above-mentioned absorption according [the outgoing radiation light from pixel fields other than the aforementioned compensation-capacitance Cs section] to the aforementioned light filters 17R, 17G, and 17B -- in addition, it is a strong weak coloring light which received further a total of four absorption by the front-face side polarizing plate 23 and the tooth-back side polarizing plate 24

[0087] In addition, the absorption of light by the front-face side polarizing plate 23 and the tooth-back side polarizing plate 24 The time of the outdoor daylight which carries out incidence to the liquid crystal display element 1 from the front penetrating the front-face side polarizing plate 23, and turning into the linearly polarized light most greatly (about 1/of quantity of lights of 2 is absorbed) The absorption by the tooth-back side polarizing plate 24 when carrying out outgoing radiation to the tooth back of the liquid crystal display element 1 Although the absorption by the tooth-back side polarizing plate 24 in case the light which changed with the polarization states of the light which penetrated the liquid crystal layer 22, and was reflected by the transflective reflecting plate 32 of the lighting means 30 carries out outgoing radiation to the front face of the liquid crystal display element 1, and the front-face side polarizing plate 23 is slight If it increases even when the absorption of light by polarizing plates 23 and 24 is slight, the part outgoing radiation luminous intensity will become weak.

[0088] Furthermore, the lighting means 30 used in this example reflects light by the transflective reflecting plate 32 of the front face, and as for the reflection factor of this transflective reflecting plate 32, since it is quite bad compared with the usual reflecting plate, the outgoing radiation luminous intensity from pixel fields other than the aforementioned compensation-capacitance Cs section becomes still weaker.

[0089] And the outgoing radiation light which is not colored [this], without carrying out outgoing radiation to the tooth-back side of the liquid crystal display element 1 The light reflected by the aforementioned compensation-capacitance electrode 13 in the inside of the tooth-back side substrate 3 It is the light with more high intensity which it is, therefore does not receive at all the absorption of light in the path which carries out outgoing radiation to the tooth back of the liquid crystal display element 1, and it is reflected by the aforementioned lighting means 30, and carries out incidence to the aforementioned liquid crystal display element 1 from the tooth back, (including [however,] the light) reflected by the data line 12.

[0090] However, the outgoing radiation light from the compensation-capacitance Cs section of the aforementioned aforementioned pixel fields It is the light reflected by the aforementioned compensation-capacitance electrode 13 in the inside of the tooth-back side substrate 3, without carrying out outgoing radiation to the tooth-back side of the liquid crystal display element 1. Therefore, since the absorption of light in the path which carries out outgoing radiation to the tooth back of the liquid crystal display element 1, and it is reflected by the aforementioned lighting means 30, and carries out incidence to the aforementioned liquid crystal display element 1 from the tooth back is not received at all The outgoing radiation light from this compensation-capacitance Cs section is light with intensity high to some extent from the outgoing radiation light from pixel fields other than the aforementioned compensation-capacitance Cs section.

[0091] Moreover, although outgoing radiation of the light reflected by the transflective reflecting plate 32 of the aforementioned lighting means 30 is carried out on various outgoing radiation squares from the front face of the liquid crystal display element 1 in order to carry out incidence of the outdoor daylight which carries out incidence to the aforementioned liquid crystal display element 1 from the front with various incident angles the light which penetrated

the field between the pixel fields which adjoin each other in the direction of a train among the light, and was obtained in ** in the front face of the liquid crystal display element 1 is interrupted with the aforementioned shading film 16 in the inside of the front-face side substrate 2, and only the light which penetrated the field without the aforementioned shading film 16 carries out outgoing radiation to the front face of the liquid crystal display element 1

[0092] Drawing 4 shows each pixel field at the time of the above-mentioned reflected type display, and the outgoing radiation light from the circumference. at the time of a reflected type display A strong weak coloring light carries out outgoing radiation from fields S1 other than the compensation-capacitance Cs section of each pixel field (field surrounded with the two-dot chain line of the fields which gave the point pattern in drawing). A strong high coloring light carries out outgoing radiation to some extent than the outgoing radiation light from fields S1 other than the aforementioned compensation-capacitance Cs section from the compensation-capacitance Cs section S2 of each pixel field (field outside the two-dot chain line of the fields which gave the point pattern in drawing).

[0093] Moreover, among field S3a between the pixel fields which adjoin each other in the direction of a train, and a line writing direction, and S3b, from field (field which gave parallel slash in drawing) S3between pixels a of the direction of a train, light is interrupted with the shading film 16, and does not carry out outgoing radiation, but a non-colored light with high enough intensity carries out outgoing radiation from field S3between pixels b of a line writing direction.

[0094] And since the coloring light which carries out outgoing radiation, and a non-colored light which carries out outgoing radiation from field S3a in the meantime are mixed and it is visible to human being's eyes from the field of the above S1 and S2, the picture observed is a bright full color picture displayed by the red whose luminosity increased by the aforementioned non-colored luminous intensity, green, and blue coloring light.

[0095] Thus, although the coloring light which carries out outgoing radiation of the time of the reflected type display using outdoor daylight from each pixel field of the liquid crystal display element 1 is a strong taper Since a non-colored light with high enough intensity carries out outgoing radiation rather than the aforementioned coloring light from the field corresponding to the light filters 17R and 17G between each pixel field, and the gap 18 between 17B, the luminosity of the whole screen can be compensated by this non-colored light, and the luminosity of a screen can display sufficient full color picture.

[0096] When the penetrated type display using the lighting light from the lighting means 30 is explained, next, at this time The lighting light from the aforementioned lighting means 30 carries out incidence to the liquid crystal display element 1 from the tooth back like the path shown in drawing 2 as the solid line. The light turns into the linearly polarized light which the light of the polarization component which met the absorption shaft with the tooth-back side polarizing plate 24 was absorbed, and met the transparency shaft of this tooth-back side polarizing plate 24, and carries out incidence to the liquid crystal layer 22.

[0097] In addition, the aforementioned lighting panel 31 which draws the light from the light source section which does not illustrate the aforementioned lighting means 30 by light guide plate 31a, and carries out outgoing radiation from the front face, It is prepared in the front face of the aforementioned light guide plate 31a, and consists of a transflective reflecting plate 32. the aforementioned transflective reflecting plate 32 In order to embrace its reflection / permeability property and to make an incident light reflect and penetrate, Although the brightness of the lighting light of this lighting means 30 which carries out outgoing radiation is low compared with the brightness of the light from the light source section, the luminescence brightness of the aforementioned light source section is set up sufficiently highly, therefore can carry out incidence of the lighting light of brightness high enough to the liquid crystal display element 1.

[0098] And in this liquid crystal display, the aforementioned compensation-capacitance electrode 13 prepared in the inside of the tooth-back side substrate 3 of the aforementioned liquid crystal display element 1 consists of a metal membrane with the high reflection factor of light. Since this compensation-capacitance electrode 13 is formed in the pixel electrode 4 which adjoins each other in a line writing direction, and the configuration which has extension 13b which counters the field between four, at the time of a penetrated type display The compensation-capacitance Cs section of each pixel field among the lighting light which carried out incidence from the tooth back of the liquid crystal display element 1, The light which carried out incidence to the portion which the aforementioned compensation-capacitance electrode 13 of the fields between the pixel fields which adjoin each other in a line writing direction has countered is interrupted by the aforementioned compensation-capacitance electrode 13 in the inside of the tooth-back side substrate 3.

[0099] Therefore, only the light which carried out incidence to other fields except the field where the compensation-capacitance Cs section of each pixel field and the adjacent pixel electrode 4, and the compensation-capacitance electrode 13 between four counter carries out incidence of the time of a penetrated type display to the liquid crystal layer 22. The light which carried out incidence to this liquid crystal layer 22 penetrates light filters 17R, 17G, and 17B,

and turns into coloring light, and the light of the polarization component in alignment with the transparency shaft of the front-face side polarizing plate 23 of them penetrates this polarizing plate 23, and carries out outgoing radiation to the front face of the liquid crystal display element 1.

[0100] At this time, the light which carried out incidence to the shading film 16 which is made to counter the field between the pixel electrode 4 which adjoins the inside of the front-face side substrate 2 in the direction of a train, and 4, and the TFT5 whole portion, and is prepared is interrupted with this shading film 16, and only the light which penetrated the field without the aforementioned shading film 16 carries out outgoing radiation to the front face of the liquid crystal display element 1.

[0101] In order that the light which the brightness of the aforementioned lighting light was high at the time of this penetrated type display, and carried out incidence from the tooth back of the liquid crystal display element 1 may only penetrate this liquid crystal display element 1 toward the front face, Since the coloring luminous intensity which the absorption of light by the aforementioned light filters 17R, 17G, and 17B and the absorption of light by the tooth-back side polarizing plate 24 and the front-face side polarizing plate 23 are [every / once], respectively, therefore carries out outgoing radiation is high enough, the full color picture of sufficient luminosity is displayed.

[0102] Drawing 5 shows the outgoing radiation light from each pixel field at the time of the above-mentioned penetrated type display. at the time of a penetrated type display The coloring light of sufficient intensity carries out outgoing radiation from fields S1 other than the compensation-capacitance Cs section of each pixel field of each field (the same field as the field surrounded with the two-dot chain line of the fields which gave the point pattern in drawing 4). The field which gave the parallel slash of the circumference (with the field S2 outside the two-dot chain line of the fields which gave the point pattern in drawing 4) From field S3a between the pixel fields which adjoin each other in the direction of a train, and a line writing direction, and all field S4 with S3b, light is interrupted by both the compensation-capacitance electrode 13, and shading both [one side or] 16, and does not carry out outgoing radiation.

[0103] Thus, the compensation-capacitance section of each aforementioned pixel field among the lighting light which carries out incidence of the time of a penetrated type display to the liquid crystal display element 1 from the tooth back, The light which carried out incidence to the portion which the aforementioned compensation-capacitance electrode 13 between the pixel fields which adjoin each other in a line writing direction has countered is interrupted by the aforementioned compensation-capacitance electrode 13. Moreover, since the light which penetrated the field between the pixel fields which adjoin each other in the direction of a train among the light which penetrated the aforementioned liquid crystal display element 1 is interrupted by the aforementioned shading film 16, Since most leakage of the light from the circumference of each pixel field cannot be found, therefore the brightness of a black display state can be reduced, a luminosity and contrast can display sufficient full color picture.

[0104] According to the above-mentioned liquid crystal display, at for this reason, the time of the reflected type display using outdoor daylight At the time of the penetrated type display which the luminosity of a screen displays sufficient full color picture, and uses the lighting light from the lighting means 30 Moreover a luminosity and contrast can display sufficient full color picture, in the above-mentioned example The light filters 17R, 17G, and 17B prepared in the inside of the front-face side substrate 2 of the liquid crystal display element 1 Since it formed so that the pixel electrode 4 whole might be covered, and the gap 18 between these light filters 17R, 17G, and 17B is set up smaller than the width of face of extension 13b of the aforementioned compensation-capacitance electrode 13, Since all the outgoing radiation light from the pixel field where the pixel electrode 4 and a counterelectrode 20 counter mutually turns into coloring light The chromaticity of the full color pixel displayed with the outgoing radiation light from the aforementioned pixel field is fully securable, and if the gap 18 between the aforementioned light filters 17R, 17G, and 17B is smaller than the width of face of extension 13b of the compensation-capacitance electrode 13 Since light does not leak from between the aforementioned compensation-capacitance electrode 13 and light filters 17R, 17G, and 17B, contrast in the above-mentioned penetrated type display can be improved more.

[0105] And in the above-mentioned example, since the gap 18 between the aforementioned light filters 17R, 17G, and 17B is set as about 4 micrometers or more, from between the pixel fields which adjoin each other in a line writing direction at the time of the above-mentioned reflected type display, outgoing radiation of the non-colored light can be carried out by width of face of about 4 micrometers or more, and an indication can be given bright more enough.

[0106] Moreover, line section 13a which counters the end marginal part of the pixel electrode 4 in the aforementioned compensation-capacitance electrode 13 in the above-mentioned example, Since it consists of extension 13b prolonged along with the edges-on-both-sides section of the aforementioned pixel electrode 4, respectively from the unilateral edge of this line section 13a and the aforementioned extension 13b forms in the pixel electrode 4 which adjoins each other in a line writing direction, and the configuration which counters the field between four, While being able to carry out outgoing radiation of the non-colored light from the both sides of each pixel field at least and being able to make a screen bright more at the time of the above-mentioned reflected type display, the leakage of the light from the both

sides of the aforementioned pixel field can be abolished at least at the time of a penetrated type display, and it can acquire good contrast.

[0107] In the above-mentioned example, furthermore, to the inside of the front-face side substrate 2 of the liquid crystal display element 1 The shading film 16 which each corresponds is formed. the field between the pixel electrode 4 which adjoins each other in the inter-electrode field of a train, i.e., direction, of the ends side of each pixel electrode 3, and 4 -- Since the aforementioned extension 13b of the aforementioned compensation-capacitance electrode 13 prepared in the inside of the tooth-back side substrate 3 is made to correspond to the whole field without the aforementioned shading film 16, the leakage of the light from the circumference of each pixel field can be abolished nearly completely, and contrast in the above-mentioned penetrated type display can be made higher.

[0108] In addition, although the liquid crystal display element 1 used in the above-mentioned example is formed independently and forms the so-called compensation capacitance Cs of a storage-capacitance method, the aforementioned compensation capacitance Cs of the gate line 11 for supplying a gate signal for the compensation-capacitance electrode 13 at TFT5 is good [the element] also as the so-called addition capacity method which used the aforementioned compensation-capacitance electrode 13 as the electrode of the aforementioned gate line 11 and one.

[0109] Moreover, although the light filters 17R, 17G, and 17B prepared in the inside of the front-face side substrate 2 of the liquid crystal display element 1 were used as the stripe-like filter corresponding to all the pixel electrodes 4 of each pixel electrode train in the above-mentioned example, these light filters 17R, 17G, and 17B may be made to counter each [which is arranged in a line writing direction and the direction of a train] pixel electrode 4 of every, and may be formed.

[0110] Drawing 6 is some front view of a liquid crystal display element showing the 2nd example of this invention, and this example is made to counter each [which makes a compensation capacitance Cs an addition capacity method, and arranges the light filters 17R 17G, and 17B of each color of red, green, and blue in a line writing direction and the direction of a train] pixel electrode 4 of every, and is formed.

[0111] That is, in this example, as shown in drawing 6 , the compensation-capacitance electrode 13 is used as the electrode of the gate line 11 and one, and the compensation capacitance Cs corresponding to each pixel electrode 4 is made into the capacity of an addition capacity method.

[0112] In this example, moreover, the light filters 17R, 17G, and 17B of each color of red, green, and blue While making it counter each [which is arranged in a line writing direction and the direction of a train] pixel electrode 4 of every, forming and forming the gap 18 corresponding to extension 13b of the aforementioned compensation-capacitance electrode 13 among the light filters 17R, 17G, and 17B which adjoin each other in a line writing direction Gap 18a is formed also among the light filters 17R, 17G, and 17B which adjoin each other in the direction of a train.

[0113] In this example the aforementioned light filters 17R, 17G, and 17B Both the breadth and the dip are formed in the slightly larger configuration than the aforementioned pixel electrode 4. Moreover, gap 18a between the light filters 17R, 17G, and 17B which adjoin each other in the direction of a train is set up so that full [of the width of face / most or full] may correspond to line section (portions of gate line 11 and one) 13a of the aforementioned compensation-capacitance electrode 13.

[0114] In this example, and the shading film 16 prepared in the inside of the front-face side substrate 2 of the liquid crystal display element 1 In the direction of a train, while adjoins each other and the unilateral marginal part (it sets to drawing 6 and is the upper-limb section) counters the edge section by the side of TFT connection of the pixel electrode 4. It forms at the width of face which has few gaps between the other side edge section (it sets to drawing 6 and is the margo-inferior section), and the marginal part of the light filters 17R, 17G, and 17B corresponding to the pixel electrode 4 of another side.

[0115] In addition, although the shading film 16 is formed in the above width of face while making this liquid crystal display element 1 counter each [which the compensation-capacitance electrode 13 is an addition capacity method, and arranges light filters 17R, 17G, and 17B in a line writing direction and the direction of a train] pixel electrode 4 of every and forming Since other composition is the same as the liquid crystal display element 1 used in the 1st example mentioned above, the overlapping explanation attaches and omits a same sign to drawing. Moreover, the same lighting means as the lighting means 30 used behind the aforementioned liquid crystal display element 1 in the 1st example is arranged also in this example.

[0116] Between the light filters 17R, 17G, and 17B which according to this example are made to counter each [which arranges light filters 17R, 17G, and 17B in a line writing direction and the direction of a train] pixel electrode 4 of every, form, and adjoin each other in a line writing direction, Among the light filters 17R, 17G, and 17B which adjoin each other in the direction of a train The gaps 18 and 18a corresponding to the compensation-capacitance electrode 13 which the reflection factor of light becomes from a high metal membrane are formed. Since it furthermore forms at the width of face which has few gaps between the marginal parts of the light filters 17R, 17G, and 17B corresponding to

the pixel electrode 4 of one of the two of the pixel electrodes 4 which adjoin each other in the direction of a train in the aforementioned shading film 16, A non-colored light with high enough intensity carries out outgoing radiation also from the gap of the light filters 17R, 17G, and 17B between the pixel fields which adjoin each other in the direction of a train, and the shading film 16 only from the field between the pixel fields which adjoin each other in a line writing direction at the time of the reflected type display using outdoor daylight.

[0117] Drawing 7 shows each pixel field at the time of the reflected type display in the case of this example, and the outgoing radiation light from the circumference. namely, at the time of a reflected type display From fields S1 other than the compensation-capacitance Cs section of each pixel field (field surrounded with the two-dot chain line of the fields which gave the point pattern in drawing) A weak coloring light of the intensity reflected by the lighting means 30 of the liquid crystal display element 1 in back carries out outgoing radiation. From the compensation-capacitance Cs section S2 of each pixel field (field outside the two-dot chain line of the fields which gave the point pattern in drawing) A strong high coloring light carries out outgoing radiation to some extent than the outgoing radiation light from fields S1 other than the aforementioned compensation-capacitance Cs section reflected by the compensation-capacitance electrode 16 in the inside of the tooth-back side substrate 3 of the liquid crystal display element 1.

[0118] In addition, since it forms in this example at the width of face which has few gaps between the marginal parts of the light filters 17R, 17G, and 17B corresponding to the pixel electrode 4 of one of the two of the pixel electrodes 4 which adjoin each other in the direction of a train in the aforementioned shading film 16, The outgoing radiation width of face of the coloring light from the field corresponding to the end edge of the pixel field of the aforementioned compensation-capacitance Cs sections S2 is latus from the case of the 1st example mentioned above.

[0119] Moreover, the field between the pixel fields which adjoin each other in the direction of a train Field (field which gave parallel slash in drawing) S3a corresponding to the aforementioned shading film 16, Field S3c corresponding to the gap between the aforementioned shading film 16 and the marginal part of light filters 17R, 17G, and 17B is included. From field S3a corresponding to the aforementioned shading film 16, among such field S3a and S3c Light is interrupted with the shading film 16, and do not carry out outgoing radiation, and from field S3c corresponding to the gap between the shading film 16 and the marginal part of light filters 17R, 17G, and 17B There is no absorption by light filters 17R, 17G, and 17B, and a non-colored light with high enough intensity moreover reflected by the compensation-capacitance electrode 13 in the inside of the tooth-back side substrate 3 of the liquid crystal display element 1 carries out outgoing radiation.

[0120] Furthermore, from field S3b between the pixel fields which adjoin each other in a line writing direction, there is no absorption by light filters 17R, 17G, and 17B, and a non-colored light with high enough intensity moreover reflected by the compensation-capacitance electrode 13 in the inside of the tooth-back side substrate 3 of the liquid crystal display element 1 carries out outgoing radiation.

[0121] Thus, since a non-colored light with high enough intensity carries out outgoing radiation also from the gap of the light filters 17R, 17G, and 17B between the pixel fields which adjoin each other in the direction of a train, and the shading film 16 only from the field between the pixel fields which adjoin each other in a line writing direction at the time of the reflected type display using outdoor daylight according to this example, a full color picture still brighter than the case where it is the 1st example can be displayed.

[0122] Drawing 7 shows the outgoing radiation light from each pixel field at the time of the penetrated type display in the case of this example, and also in this example at moreover, the time of the penetrated type display using the lighting light from the lighting means 30 The coloring light of sufficient intensity carries out outgoing radiation like the 1st example from fields S1 other than the compensation-capacitance Cs section of each pixel field of each field (the same field as the field surrounded with the two-dot chain line of the fields which gave the point pattern in drawing 7). The field which gave the parallel slash of the circumference (with the field S2 outside the two-dot chain line of the fields which gave the point pattern in drawing 7) From all field S4 with field S3a, S3c, and S1b between the pixel fields which adjoin each other in the direction of a train, and a line writing direction, light is interrupted by both the compensation-capacitance electrode 13, and shading both [one side or] 16, and does not carry out outgoing radiation.

[0123] For this reason, most leakage of the light from the circumference of each pixel field is not at the time of a penetrated type display, therefore it can display sufficient full color picture also for a luminosity and contrast.

[0124] In addition, although the liquid crystal display element 1 used in the above 1st and the 2nd example is the so-called thing of the grid-like array type which arranged each pixel electrode 4 in in the shape of a straight line in the line writing direction and the direction of a train, respectively, and arranged it in them To a line writing direction, arrange a liquid crystal display element in by turns, and it arranges each pixel electrode and the light filter of each color in the shape of a straight line. The so-called delta array (it is also called mosaic array) type thing which shifted the pixel electrode and light filters for displaying the pixel of the same color in the direction of a train by turns to the line writing direction, and arranged them at a time zigzag to it about 1.5 pitches may be used.

[0125] Moreover, although what has arranged the transflective reflecting plate 32 was used for the front face of the side light type lighting panel 31 as a lighting means 30 in the above-mentioned example, the thing which was indicated by the specification of a patent application No. 353603 and the drawing in Heisei 9 and which carries out outgoing radiation of the light from the light source section 100% theoretically, and reflects the incident light from the front 100% is sufficient as a lighting means to arrange behind the liquid crystal display element 1.
[0126] Since the incident light from the front can also be reflected with a high reflection factor while being able to carry out outgoing radiation of the light from the light source section as a lighting light at high efficiency, if such a lighting means is used, while setting up the luminescence brightness of the aforementioned light source section comparatively low and performing a penetrated type display bright enough by few power consumption, outdoor daylight can be indicated still brighter than the above 1st and the 2nd example by the reflected type.
[0127] Furthermore, as a coloring film corresponding to each pixel electrode 4, although the liquid crystal display element 1 used in the above-mentioned example is equipped with the light filters 17R, 17G, and 17B of three colors of red, green, and blue, respectively The aforementioned coloring film is not restricted to the light filters 17R, 17G, and 17B of three colors of red, green, and blue, and the aforementioned coloring film may be prepared in the inside of the tooth-back side substrate 3 of the liquid crystal display element 1.
[0128]
[Effect of the Invention] While this invention turns lighting light to the aforementioned liquid crystal display element and carries out outgoing radiation behind a liquid crystal display element In 2 way liquid crystal display which has arranged a lighting means to turn to the aforementioned liquid crystal display element the outdoor daylight which carries out incidence, and to reflect from the front of the aforementioned liquid crystal display element While being prepared in two or more pixel electrodes, TFT, a gate line and a data line, and compensation-capacitance electrodes by the inside of the tooth-back side substrate and preparing a counterelectrode in it at the inside of a front-face side substrate, the aforementioned liquid crystal display element While the coloring film of two or more colors makes each aforementioned pixel electrode correspond, respectively and is prepared in one inside of the substrates of the aforementioned couple The aforementioned compensation-capacitance electrode consists of a metal membrane with the high reflection factor of light, and it is formed in the configuration which has the extension to which this compensation-capacitance electrode counters an adjacent pixel inter-electrode field, and between the coloring films of two or more aforementioned colors corresponding to each aforementioned pixel electrode, respectively The inside of the light which the gap corresponding to the aforementioned extension of the aforementioned compensation-capacitance electrode was formed, and carried out incidence from the front, Since it considers as the composition which carries out outgoing radiation ahead while the light which penetrates the gap between the aforementioned coloring films and is reflected by the aforementioned compensation-capacitance electrode has been a non-colored light, at the time of the reflected type display using outdoor daylight The luminosity of a screen can display sufficient color picture and color picture also with sufficient luminosity and contrast can be displayed at the time of the penetrated type display using the lighting light from a lighting means.
[0129] If it forms so that the aforementioned whole pixel electrode which consists the aforementioned coloring film of a transparent electric conduction film may be covered in the liquid crystal display of this invention, and the gap between the aforementioned coloring films is set up smaller than the width of face of the aforementioned extension of the aforementioned compensation-capacitance electrode Since all the outgoing radiation light from the pixel field where a pixel electrode and a counterelectrode counter mutually turns into coloring light, The chromaticity of the color pixel displayed with the outgoing radiation light from the aforementioned pixel field is fully securable, and if the gap between the aforementioned coloring films is smaller than the width of face of the extension of the aforementioned compensation-capacitance electrode Since light does not leak from between the aforementioned compensation-capacitance electrode and coloring films, contrast in the aforementioned penetrated type display can be improved more.

[0130] Moreover, the line section to which the aforementioned compensation-capacitance electrode counters the end edge of the aforementioned pixel electrode, It consists of an extension prolonged along with the edges-on-both-sides section of the aforementioned pixel electrode, respectively from the unilateral edge of this line section. If it is desirable to form in the configuration to which the aforementioned extension counters the pixel inter-electrode field which adjoins each other the account of before and it forms the aforementioned compensation-capacitance electrode in such a configuration While being able to carry out outgoing radiation of the non-colored light from the both sides of the aforementioned pixel field at least and being able to make a screen bright more at the time of a reflected type display, the leakage of the light from the both sides of the aforementioned pixel field can be abolished at least at the time of a penetrated type display, and it can acquire good contrast.
[0131] In the liquid crystal display of this invention furthermore, to the inside of the front-face side substrate of the

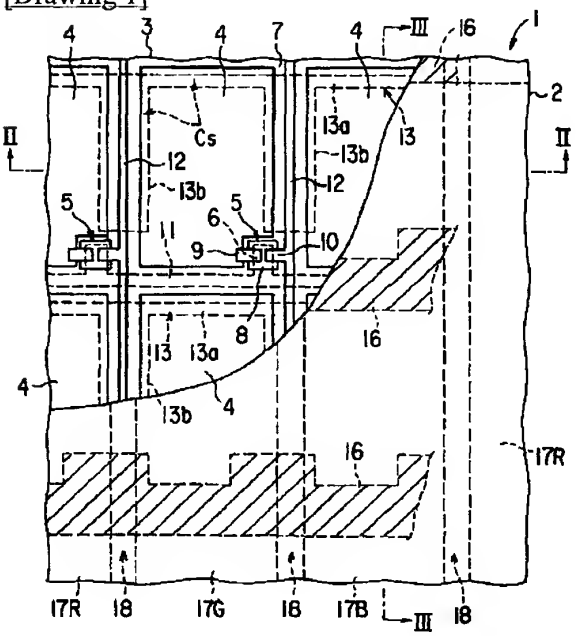
aforementioned liquid crystal display element If the shading film corresponding to the inter-electrode field by the side of the ends of each aforementioned pixel electrode is prepared, respectively and the aforementioned extension of the aforementioned compensation-capacitance electrode is made to correspond to the whole field without the aforementioned shading film Since the leakage of the light from the circumference of each pixel field is abolished nearly completely and the brightness of a black display state can be made small, contrast in a penetrated type display can be made higher.

[Translation done.]

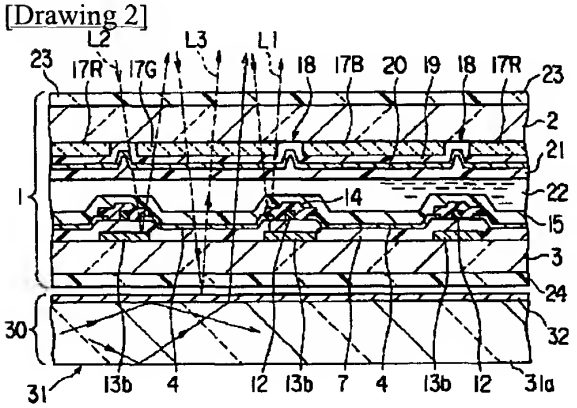
* NOTICES *

DRAWINGS

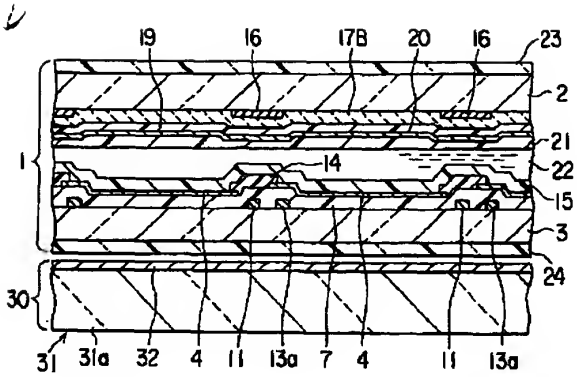
[Drawing 1]



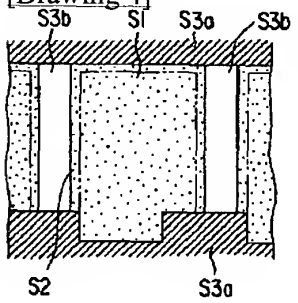
[Drawing 2]



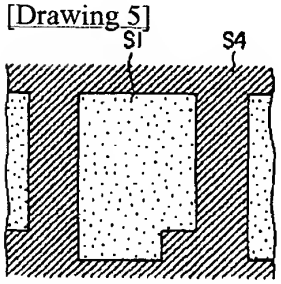
[Drawing 3]



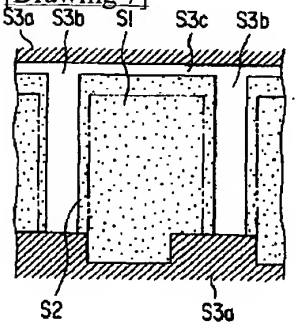
[Drawing 4]



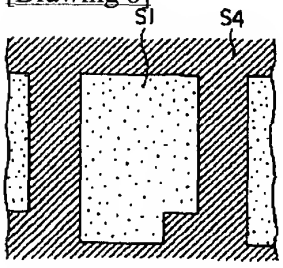
[Drawing 5]



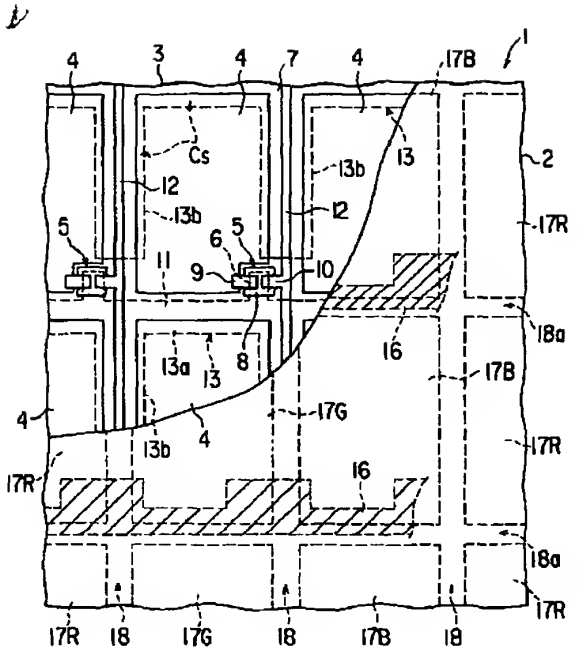
[Drawing 7]



[Drawing 8]



[Drawing 6]



[Translation done.]

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 11-295762
(43)Date of publication of application : 29.10.1999

(51)Int.CI. G02F 1/136
G02F 1/1335

(21)Application number : 10-105047
(22)Date of filing : 15.04.1998

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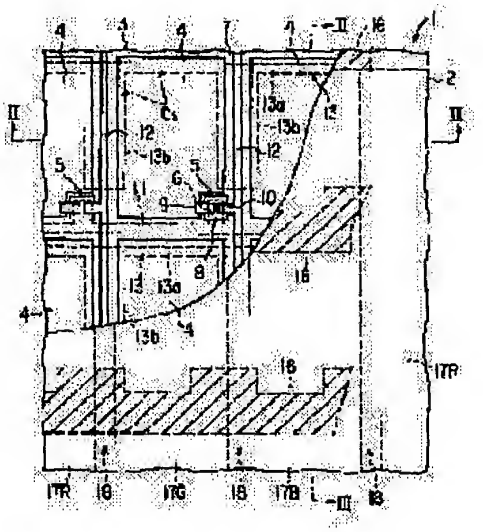
(54) LIQUID CRYSTAL DISPLAY DEVICE

(57)Abstract:
PROBLEM TO BE SOLVED: To display a color picture on a screen with sufficient brightness in the case of a reflection type display utilizing external light, and to display a color picture with sufficient contrast as well as sufficient brightness on a screen in the case of a transmission type display utilizing illuminating light from a lighting means.
SOLUTION: In a two-way liquid crystal display device in which a lighting means making illuminating light exit behind a liquid crystal display element and also reflecting external light made incident from the front is arranged, the liquid crystal element 1 is provided with picture element electrodes 3, thin film transistors(TFT) 5, gate lines 11 and data lines 12, and compensating capacitor electrodes 13 on an inner surface of a back side substrate 3, and color filters 17R, 17G, 17B an a counter electrode 20. At the same time, the compensating capacitor electrodes 13 are formed in a form having an extension part 13b facing a region between adjoining picture element electrodes, and spacing 18 corresponding to the extension parts 13b of the compensating capacitor electrodes are formed between the color filters 17R, 17G, 17B.



LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]
[Date of extinction of right]

(19)日本国特許庁（ＪＰ）　(12) **公開特許公報（Ａ）**　(11)特許出願公開番号

特開平11－295762

(43)公開日　平成11年(1999)10月29日

(51)Int.Cl.[6]		識別記号	FI		
Ｇ０２Ｆ	1/136	５００	Ｇ０２Ｆ	1/136	５００
	1/1335	５３０		1/1335	５３０

審査請求　未請求　請求項の数４　ＯＬ　（全 14 頁）

(21)出願番号　特願平10－105047

(22)出願日　平成10年(1998)４月15日

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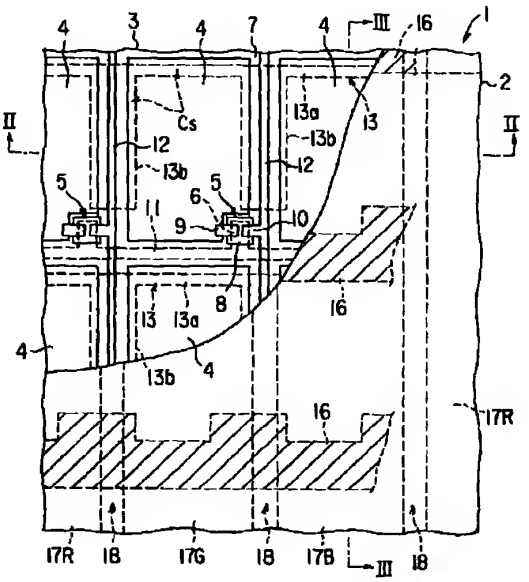
(54)【発明の名称】　液晶表示装置

(57)【要約】

【課題】外光を利用する反射型表示のときは画面の明るさが充分なカラー画像を表示し、照明手段からの照明光を利用する透過型表示のときは明るさもコントラストも充分なカラー画像を表示する。

【解決手段】液晶表示素子の背後に、照明光を出射するとともに前方から入射する外光を反射する照明手段を配置した２ウエイ液晶表示装置において、液晶表示素子１を、背面側基板３の内面に画素電極３とＴＦＴ５とゲートライン１１およびデータライン１２と補償容量電極１３を設け、前面側基板２の内面にカラーフィルタ１７Ｒ，１７Ｇ，１７Ｂと対向電極２０を設けるとともに、前記補償容量電極１３を隣り合う画素電極間の領域に対向する延長部１３ｂを有する形状に形成し、前記カラーフィルタ１７Ｒ，１７Ｇ，１７Ｂの間に、前記補償容量電極１３の延長部１３ｂに対応する間隙１８を形成した。



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【特許請求の範囲】

【請求項１】液晶層をはさんで対向する一対の基板のうちの背面側基板の内面に、マトリックス状に配列する複数の画素電極と、この各画素電極にそれぞれ接続された複数の薄膜トランジスタと、これらの薄膜トランジスタにゲート信号およびデータ信号を供給するためのゲートラインおよびデータラインと、前記各画素電極の縁部に絶縁膜を介して対向し前記画素電極との間に補償容量を形成する補償容量電極とが設けられ、前面側基板の内面に、前記各画素電極に対向する対向電極が設けられ、前記一対の基板のいずれか一方の内面に、複数の色の着色膜が前記各画素電極にそれぞれ対応させて設けられるとともに、前記補償容量電極が光の反射率が高い金属膜からなっており、この補償容量電極が、隣り合う画素電極間の領域に対向する延長部を有する形状に形成され、前記複数の色の着色膜は前記補償容量電極の前記延長部に対応する位置に間隙を形成するように配列され、前方から入射した光のうち、前記着色膜間の間隙を透過して前記補償容量電極で反射される光が無着色光のまま前方に出射する液晶表示素子と、

前記液晶表示素子の背後に配置され、照明光を前記液晶表示素子に向けて出射するとともに、前記液晶表示素子の前方から入射する外光を前記液晶表示素子に向けて反射する照明手段とを備えたことを特徴とする液晶表示装置。

【請求項２】前記着色膜は、透明導電膜からなる前記画素電極全体を覆うように形成されており、前記着色膜間の間隙が、前記補償容量電極の延長部の幅よりも小さく設定されていることを特徴とする請求項１に記載の液晶表示装置。

【請求項３】前記補償容量電極は、前記画素電極の一端縁部に対向するライン部と、このライン部の一側縁から前記画素電極の両側縁部に沿ってそれぞれ延びる延長部とからなっていることを特徴とする請求項１または２に記載の液晶表示装置。

【請求項４】前記液晶表示素子の前面側基板の内面に、前記各画素電極の両端側の電極間領域にそれぞれ対応する遮光膜が設けられており、前記補償容量電極の前記延長部が、前記遮光膜の無い領域全体に対応していることを特徴とする請求項３に記載の液晶表示装置。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】この発明は、反射型表示と透過型表示とのいずれも利用する２ウエイ表示型の表示装置に関するものである。

【０００２】

【従来の技術】液晶表示装置として、自然光や室内光等の外光を利用する反射型表示と、一般にバックライトと呼ばれる照明手段からの照明光を利用する透過型表示との両方を行なう、いわゆる２ウエイ表示型のものがある。

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【０００３】この２ウエイ液晶表示装置は、液晶表示素子と、この液晶表示素子の背後に配置され、照明光を前記液晶表示素子の背面に向けて出射するとともに、前記液晶表示素子の前方から入射する外光を前記液晶表示素子の背面に向けて反射する照明手段とからなっている。

【０００４】前記液晶表示素子としては、一般に、アクティブ素子に薄膜トランジスタ（以下、ＴＦＴと記す）を用いたアクティブマトリックス方式のものが使用されている。

【０００５】このアクティブマトリックス方式の液晶表示素子は、液晶層をはさんで対向する一対の基板のうちの一方の基板の内面に、マトリックス状に配列する複数の画素電極と、この各画素電極にそれぞれ接続された複数のＴＦＴと、これらのＴＦＴにゲート信号およびデータ信号を供給するためのゲートラインおよびデータラインと、前記画素電極の縁部に絶縁膜を介して対向し前記画素電極との間に補償容量を形成する補償容量電極とを設け、他方の基板の内面に、前記複数の画素電極に対向する対向電極を設けた構成となっている。

【０００６】さらに、前記液晶表示素子には、白黒画像を表示するものと、カラー画像を表示するものとがあり、フルカラー画像等の多色カラー画像を表示する液晶表示素子では、前記一対の基板のいずれか一方（一般には前面側基板）の内面に、複数の色の着色膜を前記複数の画素電極にそれぞれ対応させて設けている。

【０００７】前記着色膜は、一般に、赤、緑、青の３色のカラーフィルタであり、各色のカラーフィルタはそれぞれ、各画素電極と対向電極とが互いに対向する各画素領域を透過する光のほとんどを着色光として出射するため、前記画素電極全体を覆う大きさに形成されている。

【０００８】この着色膜を備えた液晶表示素子は、前記各画素領域の周囲からの光の漏れを無くして良好なコントラストのカラー画像を表示するため、前面側基板の内面に、各画素電極間の領域に対応させて、一般にブラックマスクと呼ばれる遮光膜を設けているのが普通である。

【０００９】また、液晶表示素子としては、液晶層の液晶の分子を両基板間において所定のツイスト角でツイスト配向させたＴＮ（ツイステッド・ネマティック）型のものが多く採用されており、このＴＮ型の液晶表示素子では、その前面側基板の前面と背面側基板の背面とにそれぞれ偏光板を、その透過軸を所定の方向に向けた状態で配置している。

【００１０】前記照明手段としては、照明光を出射する照明パネルの前面に半透過反射板を配置したものが用いられている。前記照明パネルには、一般に、少なくとも一端面を光の入射面とし、前面を前記端面から取り込んだ光の出射面とした導光板と、この導光板の前記端面に対向させて配置された光源部とからなるサイドライト型

と呼ばれるものが利用されており、前記半透過反射板は、前記導光板の前面に配置されている。

【００１１】前記サイドライト型の照明パネルは、光源部からの光を導光板で導いてその前面から出射するものであり、前記光源部からの光を導光板内にその端面から取り込み、その光を導光板の前面および背面での反射の繰り返しにより導いて、導光板前面のほぼ全域から出射する。また、前記半透過反射板は、その反射／透過率特性に応じて入射光を反射および透過させる。

【００１２】前記２ウエイ液晶表示装置は、充分な明るさの外光が得られるときは外光を利用する反射型表示を行ない、充分な明るさの外光が得られないときは前記照明手段からの照明光を利用する透過型表示を行なうものであり、前記照明手段の光源部は、透過型表示を行なうときに点灯される。

【００１３】すなわち、外光を利用する反射型表示のときは、液晶表示素子の前方から入射し、この液晶表示素子を透過して前記照明手段に入射した光が前記半透過反射板によりその反射／透過率特性に応じた反射率で反射され、その反射光が前記液晶表示素子にその背面から入射し、この液晶表示素子を透過して前方に出射して、その各画素領域からの出射光により画像が表示される。

【００１４】また、前記照明手段からの照明光を利用する透過型表示のときは、前記照明パネルの前面に出射する照明光が前記半透過反射板をその反射／透過率特性に応じた透過率で透過し、その透過光が前記液晶表示素子にその背面から入射し、この液晶表示素子を透過して前方に出射して、その各画素領域からの出射光により画像が表示される。

【００１５】前記液晶表示素子の各画素領域からの出射光は、各画素電極にそれぞれ対応させて赤、緑、青の３色のカラーフィルタを設けた液晶表示素子を用いる液晶表示装置の場合、赤、緑、青の着色光であり、これらの着色光の組み合わせによりフルカラー画像が表示される。

【００１６】

【発明が解決しようとする課題】しかし、従来のカラー画像を表示する２ウエイ液晶表示装置は、照明手段からの照明光を利用する透過型表示のときは、その表示の観察環境の明るさに比べて液晶表示装置からの出射光の強度が高く、充分な明るさのカラー画像を表示できるが、外光を利用する反射型表示のときは、表示観察環境の明るさに比べて液晶表示装置からの出射光の強度が極端に低くなり、画面全体が暗くなってしまうという問題をもっている。

【００１７】これは、光の透過経路における光の吸収によるものであり、特に、液晶表示素子が着色膜（例えば赤、緑、青の３色のカラーフィルタ）を備えている場合は、液晶表示素子を透過する可視光帯域の光うち、前記着色膜の色に対応する波長帯域の光が前記着色膜を透過して着色光になり、他の波長帯域の光は前記着色膜で吸収されるため、入射光の強度に比べて、液晶表示素子を出射する着色光の強度がかなり弱くなる。

【００１８】そして、前記２ウエイ液晶表示装置は、充分な明るさの外光が得られないとき、つまり表示観察環境が暗いときに、前記照明手段からの照明光を利用する透過型表示を行なうものであり、この透過型表示のときは、前記照明光の輝度が表示観察環境の明るさよりもはるかに高く、また液晶表示素子の背面から入射した光がこの液晶表示素子をその前面に向かって透過するだけであるため、前記着色膜による光の吸収は一度だけであるから、液晶表示素子を透過してその前面に出射する着色光の強度は、表示観察環境の明るさよりも充分に高い。そのため、透過型表示のときは、充分な明るさのカラー画像を表示できる。

【００１９】一方、外光を利用する反射型表示のときは、入射する外光が表示観察環境の明るさに応じた強度の光であり、その光が、液晶表示素子を透過してその背後の照明手段により反射され、再び前記液晶表示素子を透過してその前面に出射する経路での光吸収により強度を弱めるため、出射光の強度は、表示観察環境の明るさよりも弱い。

【００２０】したがって、前記液晶表示素子が着色膜を備えている場合は、前記着色膜による光の吸収により透過光の強度がかなり弱くなり、しかも反射型表示のときは、入射光が液晶表示素子をその背面方向に透過する経路と前面方向に透過する経路とにおいて着色膜を二度透過するため、前記着色膜による吸収量がさらに大きくなり、出射する着色光の強度が、表示観察環境の明るさに比べて極端に弱くなる。

【００２１】また、従来の着色膜を備えた液晶表示素子は、上述したように、良好なコントラストのカラー画像を表示するために、前面側基板の内面に、各画素電極間の領域に対応させて遮光膜を設けているのが普通であり、したがって、カラー画像は、各画素領域からの出射光だけで表示される。

【００２２】そのため、従来のカラー画像を表示する２ウエイ液晶表示装置は、照明手段からの照明光を利用する透過型表示のときは充分な明るさのカラー画像を表示できるが、外光を利用する反射型表示のときは、画面全体が暗い。

【００２３】この発明は、外光を利用する反射型表示のときは、画面の明るさが充分なカラー画像を表示し、照明手段からの照明光を利用する透過型表示のときは、明るさもコントラストも充分なカラー画像を表示することができる２ウエイ表示型の液晶表示装置を提供することを目的としたものである。

【００２４】

【課題を解決するための手段】この発明の液晶表示装置は、液晶層をはさんで対向する一対の基板のうちの背面

側基板の内面に、マトリックス状に配列する複数の画素電極と、この各画素電極にそれぞれ接続された複数のＴＦＴ（薄膜トランジスタ）と、これらのＴＦＴにゲート信号およびデータ信号を供給するためのゲートラインおよびデータラインと、前記各画素電極の縁部に絶縁膜を介して対向し前記画素電極との間に補償容量を形成する補償容量電極とが設けられ、前面側基板の内面に、前記各画素電極に対向する対向電極が設けられ、前記一対の基板のいずれか一方の内面に、複数の色の着色膜が前記各画素電極にそれぞれ対応させて設けられるとともに、前記補償容量電極が光の反射率が高い金属膜からなっており、この補償容量電極が、隣り合う画素電極間の領域に対向する延長部を有する形状に形成され、前記複数の色の着色膜は前記補償容量電極の前記延長部に対応する位置に間隙を形成するように配列され、前方から入射した光のうち、前記着色膜間の間隙を透過して前記補償容量電極で反射される光が無着色光のまま前方に出射する液晶表示素子と、前記液晶表示素子の背後に配置され、照明光を前記液晶表示素子に向けて出射するとともに、前記液晶表示素子の前方から入射する外光を前記液晶表示素子に向けて反射する照明手段とを備えたことを特徴とするものである。

【００２５】この液晶表示装置は、充分な明るさの外光が得られるときは外光を利用する反射型表示を行ない、充分な明るさの外光が得られないときは前記照明手段からの照明光を利用する透過型表示を行なうものである。

【００２６】この液晶表示装置は、液晶表示素子の背面側基板の内面に設けられた補償容量電極が光の反射率が高い金属膜からなっており、この補償容量電極が、隣り合う画素電極間の領域に対向する延長部を有する形状に形成されているため、外光を利用する反射型表示のときは、各画素電極と対向電極とが互いに対向する各画素領域のうちの前記補償容量電極が対向する補償容量部と、隣り合う画素電極間の前記補償容量電極が対向する領域とに入射した光が、液晶表示素子の背面側基板の内面において前記補償容量電極により反射されて液晶表示素子の前面に出射し、他の領域に入射した光は、前記液晶表示素子の背面に出射してその背後の照明手段により反射され、再び前記液晶表示素子を透過してその前面に出射する。

【００２７】さらに、前記液晶表示素子は、透明導電膜からなる各画素電極にそれぞれ対応する複数の色の着色膜の間に、前記補償容量電極の延長部に対応する間隙を形成したものであるため、液晶表示素子に入射した光のうち、各画素領域に入射した光が着色膜を透過して着色光になり、前記着色膜の間の間隙に入射した光は着色しない。

【００２８】すなわち、反射型表示のときは、液晶表示素子の各画素領域に入射した光のうち、前記補償容量部に入射した光が、着色膜と液晶層とを透過して前記補償容量電極により反射され、再び前記液晶層と着色膜とを透過して液晶表示素子の前面に出射する。

【００２９】また、前記画素領域のうちの補償容量部以外の領域に入射した光は、着色膜と液晶層とを透過して液晶表示素子の背面に出射し、その光が前記照明手段により反射されて前記液晶表示素子にその背面から入射し、液晶層と着色膜とを透過して液晶表示素子の前面に出射する。

【００３０】また、隣り合う各画素領域の間の領域、つまり前記着色膜の間の間隙に入射した光は、着色膜を透過しないために無着色光のまま液晶層を透過して前記補償容量電極により反射され、再び前記液晶層を透過して液晶表示素子の前面に出射する。

【００３１】そして、これらの出射光のうち、前記各画素領域からの出射光は、液晶表示素子をその背面方向に透過する経路と前面方向に透過する経路とにおいて前記着色膜を二度透過した光であるため、入射した外光の強度に比べて、着色膜による二度の吸収を受けた強度の弱い着色光であるが、各画素領域の間の前記着色膜間の間隙に対応する領域からの出射光は、前記着色膜による光の吸収を全く受けない無着色光であるため、前記着色光に比べれば、充分強度の高い光である。

【００３２】しかも、この無着色の出射光は、液晶表示素子の背面側に出射することなく、背面側基板の内面において前記補償容量電極により反射された光であり、したがって、液晶表示素子の背面に出射し前記照明手段により反射されて前記液晶表示素子にその背面から入射する経路での光の吸収を全く受けない、より強度の高い光である。

【００３３】このため、外光を利用する反射型表示のときは、前記液晶表示素子の各画素領域から出射する着色光は強度の弱い光であるが、各画素領域の間の着色膜間の間隙に対応する領域から前記着色光よりも充分強度の高い無着色光が出射するため、この無着色光により画面全体の明るさを補い、画面の明るさが充分なカラー画像を表示することができる。

【００３４】一方、前記照明手段からの照明光を外光を利用する透過型表示のときは、液晶表示素子にその背面から入射する前記照明光のうち、前記各画素領域の補償容量部と、隣り合う各画素領域の間の領域のうちの前記補償容量電極が対向している部分とに入射した光が、背面側基板の内面において前記補償容量電極により遮られ、他の領域に入射した光だけが液晶層に入射する。そして、液晶層に入射した光は、前記着色膜を透過して着色光となり、その着色光が液晶表示素子の前面に出射する。

【００３５】この透過型表示のときは、前記照明光の輝度が高く、また、液晶表示素子の背面から入射した光がこの液晶表示素子をその前面に向かって透過するだけであるため、前記着色膜による光の吸収は一度だけであ

り、したがって、出射する着色光の強度は充分高い。

【００３６】そして、透過型表示のときは、前記各画素電極の縁部と前記補償容量電極とその間の絶縁膜とで形成された補償容量部と、隣り合う画素電極間の前記補償容量電極が対向している部分とに入射した光が前記補償容量電極により遮られるため、各画素領域の周囲からの光の漏れがほとんど無くなり、したがって、明るさもコントラストも充分なカラー画像を表示することができる。

【００３７】

【発明の実施の形態】この発明は、上記のように、液晶表示素子の背後に、照明光を前記液晶表示素子に向けて出射するとともに、前記液晶表示素子の前方から入射する外光を前記液晶表示素子に向けて反射する照明手段を配置した２ウエイ液晶表示装置において、前記液晶表示素子を、その背面側基板の内面に、複数の画素電極と、ＴＦＴと、ゲートラインおよびデータラインと、補償容量電極とが設けられ、前面側基板の内面に対向電極が設けられるとともに、前記一対の基板のいずれか一方の内面に、複数の色の着色膜が前記各画素電極にそれぞれ対応させて設けられるとともに、前記補償容量電極が光の反射率が高い金属膜からなっており、この補償容量電極が、隣り合う画素電極間の領域に対向する延長部を有する形状に形成され、前記各画素電極にそれぞれ対応する前記複数の色の着色膜の間に、前記補償容量電極の前記延長部に対応する間隙が形成され、前方から入射した光のうち、前記着色膜間の間隙を透過して前記補償容量電極で反射される光が無着色光のまま前方に出射する構成とすることにより、外光を利用する反射型表示のときは、画面の明るさが充分なカラー画像を表示し、照明手段からの照明光を利用する透過型表示のときは、明るさもコントラストも充分なカラー画像を表示することができるようにしたものである。

【００３８】この発明の液晶表示装置において、前記着色膜は、前記画素電極全体を覆うように形成し、前記着色膜間の間隙を、前記補償容量電極の前記延長部の幅よりも小さく設定するのが望ましい。

【００３９】このように、前記着色膜を透明導電膜からなる画素電極全体を覆うように形成すれば、画素電極と対向電極とが互いに対向する画素領域からの出射光の全てが着色光になるため、前記画素領域からの出射光で表示されるカラー画素の色度を充分に確保することができ、また、前記着色膜間の間隙が前記補償容量電極の延長部の幅よりも小さければ、前記補償容量電極と着色膜との間から光が漏れることがないため、前記透過型表示におけるコントラストをより良くすることができる。

【００４０】また、前記補償容量電極は、前記画素電極の一端縁部に対向するライン部と、このライン部の一側縁から前記画素電極の両側縁部に沿ってそれぞれ延びる延長部とからなる形状に形成し、前記延長部を、前記隣り合う画素電極間の領域に対向させるのが好ましい。

【００４１】前記補償容量電極をこのような形状に形成すれば、反射型表示のときに、少なくとも前記画素領域の両側から無着色光を出射させて、より画面を明るくすることができるとともに、透過型表示のときは、少なくとも前記画素領域の両側からの光の漏れを無くして、良好なコントラストを得ることができる。なお、前記補償容量電極は、ＴＦＴにゲート信号を供給するためのゲートラインと別に形成しても、前記ゲートラインと一体の電極としてもよい。

【００４２】さらに、この発明の液晶表示装置においては、前記液晶表示素子の前面側基板の内面に、前記各画素電極の両端側の電極間領域にそれぞれ対応する遮光膜を設け、前記補償容量電極の前記延長部を、前記遮光膜の無い領域全体に対応させるのが望ましく、このような構成とすれば、各画素領域の周囲からの光の漏れをほぼ完全に無くして、透過型表示におけるコントラストをより高くすることができる。

【００４３】

【実施例】図１～図５はこの発明の第１の実施例を示しており、図１は本実施例の液晶表示装置で用いた液晶表示素子の一部分の正面図、図２は図１のII－II線に沿う液晶表示装置の断面図、図３は図１の III－III 線に沿う液晶表示装置の断面図である。

【００４４】この実施例の液晶表示装置は、図２および図３に示すように、カラー画像を表示する液晶表示素子１と、この液晶表示素子１の背後に配置された光の反射機能を兼ね備えた照明手段３０とから構成されている。

【００４５】前記液晶表示素子１は、アクティブ素子にＴＦＴを用いたものであり、図１～図３に示すように、液晶層２２をはさんで対向する一対の基板（ガラス等からなる透明基板）２，３のうち、背面側基板３の内面には、マトリックス状に配列する複数の透明導電膜からなる画素電極４と、この各画素電極４にそれぞれ接続された複数のＴＦＴ５と、これらのＴＦＴ５にゲート信号およびデータ信号を供給するためのゲートライン１１およびデータライン１２と、前記各画素電極４との間に補償容量を形成する補償容量電極１３とが設けられている。

【００４６】なお、この実施例で用いた液晶表示素子１は、前記各画素電極４を、行方向（画面の左右方向）および列方向（画面の上下方向）にそれぞれ直線状に並べて配列した、いわゆる格子状配列型のものである。

【００４７】前記ＴＦＴ５は、図１に示したように、背面側基板３上に形成されたゲート電極６と、このゲート電極６を覆うゲート絶縁膜７と、このゲート絶縁膜７の上に前記ゲート電極６と対向させて形成されたｉ型半導体膜８と、このｉ型半導体膜８の両側部の上にｎ型半導体膜（図示せず）を介して形成されたソース電極９およびドレイン電極１０とからなっている。

【００４８】前記ゲートライン１１は、各画素電極行の

一側にそれぞれ沿わせて配線されており、各行のＴＦＴ５のゲート電極６は、その行に対応するゲートライン１１に一体に形成されている。なお、前記ＴＦＴ５のゲート絶縁膜（透明膜）７は、前記基板３のほぼ全面にわたって形成されており、前記ゲートライン１１は、その端子部を除いてゲート絶縁膜７で覆われている。

【００４９】また、前記データライン１２は、前記ゲート絶縁膜７の上に、各画素電極列の一側にそれぞれ沿わせて配線されており、各列のＴＦＴ５のドレイン電極１０は、その列に対応するデータライン１２につながっている。

【００５０】なお、この実施例ではデータライン１２をゲート絶縁膜７の上に配線し、各列のＴＦＴ５のドレイン電極１０をそれぞれ、その列に対応するデータライン１２に一体に形成しているが、前記データライン１２は、ＴＦＴ５を絶縁膜で覆ってその上に配線し、前記絶縁膜に設けたコンタクト孔において前記ＴＦＴ５のドレイン電極１０と接続してもよい。

【００５１】そして、前記画素電極４は前記ゲート絶縁膜７の上に形成されており、これらの画素電極４は、その一側縁の端部において対応するＴＦＴ５のソース電極９に接続されている。

【００５２】また、前記補償容量電極１３は、前記基板３上に各画素電極行にそれぞれ対応させて、その行の各画素電極４の縁部にそれぞれ対向する形状に形成されており、この補償容量電極１３と前記画素電極４の縁部とその間のゲート絶縁膜７とにより、非選択期間の画素電極４の電位の変動を補償するための補償容量（ストレージキャパシタ）Ｃｓが形成されている。

【００５３】前記補償容量電極１３は、前記画素電極４の一端縁部に対向するライン部１３ａと、このライン部１３ａの一側縁から前記画素電極４の両側縁部に沿ってそれぞれ延びる延長部１３ｂとからなっており、したがって前記補償容量Ｃｓは、各画素電極４の一端縁部と両側縁部との３つの縁部に対応している。

【００５４】この補償容量電極１３の前記ライン部１３ａは、前記画素電極４のＴＦＴ接続側とは反対側の端縁部に対向させて、上記ゲート配線１０と平行に形成されている。

【００５５】また、前記延長部１３ｂは、前記画素電極４のＴＦＴ接続側の端部近くに達する長さにわたって、その両側縁部が行方向において隣り合う画素電極４，４のそれぞれの側縁部に対向する幅に形成されており、したがって、この延長部１３ｂは、前記隣り合う画素電極４，４間の領域の大部分の長さの領域に、その全幅わたって対向している。

【００５６】容量配線１３とデータ配線１２は、いずれも、低抵抗でかつ光の反射率が高い金属（例えばアルミニウム系合金）膜で形成されており、前記ゲート配線１１は前記容量配線１３と同じ金属膜で形成されている。なお、前記ゲート配線１１と容量配線１３は、ゲート絶縁膜７の上に形成する画素電極４やデータ配線１２との間の絶縁耐圧を高くするため、その表面を陽極酸化処理されている。

【００５７】さらに、図１では省略しているが、前記背面側基板３の内面には、図２および図３に示すように、前記ＴＦＴ５およびデータ配線１２を覆う透明なオーバーコート絶縁膜１４が設けられており、その上に、画素電極４の配列領域全体にわたって配向膜１５が形成されている。

【００５８】一方、前面側の基板２の内面には、前記各画素電極４の両端側の電極間領域、つまり列方向において隣り合う画素電極４，４間の領域にそれぞれ対応する遮光膜１６が設けられている。なお、図１では、遮光膜１６を区別しやすくするために、遮光膜部分に平行斜線を施している。

【００５９】前記遮光膜１６は、例えばクロム等の暗色系の金属膜からなっており、この遮光膜１６は、前記列方向において隣り合う画素電極４，４間の領域および前記ＴＦＴ５部分の全体に対向する形状に形成されており、前記背面側基板３の内面に設けられた前記補償容量電極１３の延長部１３ｂは、前記遮光膜１６の無い領域全体に対応している。

【００６０】なお、この実施例では、前記遮光膜１６を、その一側縁部（図１において上縁部）が、前記列方向において隣り合う一方の画素電極４のＴＦＴ接続側の端縁部に対向し、他側縁部（図１において下縁部）が、他方の画素電極４のＴＦＴ接続側とは反対側の端縁部に対向する前記補償容量電極１３のライン部１３ａの一側部（画素電極４の端縁側の側部）に対向する幅に形成しており、したがって、前記補償容量電極１３のライン部１３ａの他側部（画素電極４の中央側の側部）は、前記遮光膜１６で覆われていない。

【００６１】また、この前面側基板２の内面には、透過波長帯域が異なる複数の色の着色膜、例えば赤、緑、青の３色のカラーフィルタ１７Ｒ，１７Ｇ，１７Ｂが、前記画素電極４にそれぞれ対応させて設けられている。

【００６２】これらのカラーフィルタ１７Ｒ，１７Ｇ，１７Ｂは、各画素電極列の全ての画素電極４に対応するストライプ状フィルタであり、赤色フィルタ１７Ｒ、緑色フィルタ１７Ｇ、青色フィルタ１７Ｂの順で交互に並べて形成されている。

【００６３】前記カラーフィルタ１７Ｒ，１７Ｇ，１７Ｂは、各画素電極列にそれぞれ対応させて設けられており、これらのカラーフィルタ１７Ｒ，１７Ｇ，１７Ｂの間に、前記補償容量電極１３の画素電極４，４間の領域に対向する延長部１３ｂに対応する間隙１８が形成されている。

【００６４】なお、前記カラーフィルタ１７Ｒ，１７Ｇ，１７Ｂは、各画素電極列の画素電極４の全体を覆う

ように、前記画素電極４の幅よりも僅かに幅広に形成されており、これらのカラーフィルタ１７Ｒ，１７Ｇ，１７Ｂの間の間隙１８は、ほぼ４μｍ以上で、かつ前記補償容量電極１３の延長部１３ｂの幅よりも小さい幅に設定されている。

【００６５】また、前記カラーフィルタ１７Ｒ，１７Ｇ，１７Ｂは、その間の間隙１８を含んで透明な保護絶縁膜１９により覆われており、この保護絶縁膜１９の上に、前記画素電極４の全てに対向する一枚膜状の透明な対向電極２０が設けられ、さらにその上に配向膜２１が形成されている。なお、前記保護絶縁膜１９は、カラーフィルタ１７Ｒ，１７Ｇ，１７Ｂの材質を適正に選択することにより省くことができる。

【００６６】そして、上記前面側基板２と背面側基板３は、その周縁部において図示しない枠状シール材を介して接合されており、これら両基板２，３間の前記シール材で囲まれた領域に液晶層２２が設けられている。

【００６７】また、上記一対の基板２，３の内面に設けられた前記配向膜１５，２１はそれぞれ、その膜面を所定方向にラビングすることによって配向処理されており、両基板２，３間の液晶層２２の液晶分子は、前面側基板２の配向膜２１と背面側基板３の配向膜１５とによりそれぞれの基板２，３の近傍における配向方向を規制され、両基板２，３間において所定の配向状態で配向している。

【００６８】さらに、上記一対の基板２，３の外面にはそれぞれ、偏光板２３，２４が配置されており、これらの偏光板２３，２４は、それぞれの透過軸を所定の方向に向けた状態で設けられている。

【００６９】なお、この液晶表示素子１はＴＮ型のものであり、前記液晶分子は両基板２，３間において所定のツイスト角（例えばほぼ９０°）でツイスト配向し、前記偏光板２３，２４は、それぞれの透過軸を互いにほぼ直交させるか、あるいはほぼ平行にして設けられている。

【００７０】また、前記液晶分子のツイスト角と前面側基板２の近傍における配向方向および前面側偏光板２３の透過軸の方向は、液晶層２２に駆動電界が印加されていない状態（液晶分子が基板２，３面に対して最も倒伏した初期のツイスト配向状態に配向している状態）にあるとき、液晶表示素子１の前方から入射した光のうちの背面側基板３の内面において前記補償容量電極１３により反射されて液晶表示素子１の前面に出射する光の透過率がほぼ最大となるように設定されている。

【００７１】次に、前記液晶表示素子１の背後に配置された照明手段３０について説明すると、この実施例で用いた照明手段３０は、図２および図３に示すように、サイドライト型と呼ばれる照明パネル３１の前面に半透過反射板３２を配置したものである。

【００７２】すなわち、前記照明パネル３１は、少なくとも一端面を光の入射面とし、前面を前記端面から取り込んだ光の出射面とした導光板３１ａと、この導光板の前記端面に対向させて配置された光源部（図示せず）とから構成されており、前記半透過反射板３２は、前記導光板３１ａの前面に配置されている。

【００７３】なお、前記導光板３１ａには、一般に、アクリル系樹脂等からなる平板状の透明板が用いられており、前記光源部には、直管状の蛍光ランプや、複数のＬＥＤ（発光ダイオード）を整列したＬＥＤアレイ等が用いられている。

【００７４】前記照明パネル３１は、図示しない光源部からの光を前記導光板３１ａで導いてその前面から出射するものであり、前記光源部からの光を導光板３１ａ内にその端面から取り込み、その光を図２に実線で示した経路のように導光板３１ａの前面および背面での反射の繰り返しにより導いて、導光板前面のほぼ全域から出射する。また、前記半透過反射板３２は、その反射／透過率特性に応じて入射光を反射および透過させる。

【００７５】この液晶表示装置は、充分な明るさの外光が得られるときは外光を利用する反射型表示を行ない、充分な明るさの外光が得られないときは前記照明手段３０からの照明光を利用する透過型表示を行なうものであり、前記照明手段３０の光源部は、透過型表示を行なうときに点灯される。

【００７６】まず、外光を利用する反射型表示について説明すると、このときは、液晶表示素子１にその前方から入射する外光が、前面側偏光板２３によりその吸収軸に沿った偏光成分の光を吸収されて、この前面側偏光板２３の透過軸に沿った直線偏光となり、その光のうち、前面側基板２の内面に列方向において隣り合う画素電極４，４間の領域およびＴＦＴ５部分の全体に対向させて設けられている遮光膜１６に入射した光がこの遮光膜１６により遮られ、前記遮光膜１６が無い領域に入射した光が液晶層２２に入射する。

【００７７】そして、この液晶表示装置においては、前記液晶表示素子１の背面側基板３の内面に設けられた前記補償容量電極１３が光の反射率が高い金属膜からなっており、この補償容量電極１３が、行方向において隣り合う画素電極４，４間の領域に対向する延長部１３ｂを有する形状に形成されているため、反射型表示のときは、各画素電極４と対向電極２０とが互いに対向する各画素領域のうちの前記補償容量電極１３が対向する補償容量Ｃｓ部と、行方向において隣り合う画素電極４，４間の前記補償容量電極１３が対向する領域とに入射した光が、図２に破線で示した経路Ｌ１，Ｌ２のように、液晶表示素子１の背面側基板３の内面において前記補償容量電極１３により反射されて液晶表示素子１の前面に出射し、他の領域に入射した光は、図２に破線で示した経路Ｌ３のように、液晶表示素子１の背面に出射してその背後の照明手段３０の前面の半透過反射板３２により反

射され、再び前記液晶表示素子１を透過してその前面に出射する。

【００７８】さらに、前記液晶表示素子１は、各画素電極４にそれぞれ対応する赤、緑、青のカラーフィルタ１７Ｒ，１７Ｇ，１７Ｂの間に、補償容量電極１３の延長部１３ｂに対応する間隙１８を形成したものであるため、液晶表示素子１に入射した光のうち、各画素領域に入射した光がカラーフィルタ１７Ｒ，１７Ｇ，１７Ｂを透過して赤、緑、青の着色光になり、前記カラーフィルタ１７Ｒ，１７Ｇ，１７Ｂの間の間隙１８に入射した光は着色しない。

【００７９】すなわち、反射型表示のときは、液晶表示素子１の各画素領域に入射した光のうち、補償容量Ｃｓ部に入射した光が、カラーフィルタ１７Ｒ，１７Ｇ，１７Ｂと液晶層２２とを透過して補償容量電極１３により反射され、再び前記液晶層２２とカラーフィルタ１７Ｒ，１７Ｇ，１７Ｂとを透過して、そのうちの前面側偏光板２３の透過軸に沿った偏光成分の光が、この偏光板２３を透過して液晶表示素子１の前面に出射する。

【００８０】また、前記画素領域のうちの補償容量Ｃｓ部以外の領域に入射した光は、カラーフィルタ１７Ｒ，１７Ｇ，１７Ｂと液晶層２２とを透過して背面側偏光板２４に入射し、そのうちの前記背面側偏光板２４の透過軸に沿った偏光成分の光が、この偏光板２４を透過して液晶表示素子１の背面に出射し、その光が前記照明手段３０の前面の半透過反射板３２により反射されて前記液晶表示素子１にその背面から入射し、前記背面側偏光板２４と液晶層２２とカラーフィルタ１７Ｒ，１７Ｇ，１７Ｂと前面側偏光板２３とを順に透過して液晶表示素子１の前面に出射する。

【００８１】また、行方向において隣り合う各画素領域の間の領域、つまりカラーフィルタ１７Ｒ，１７Ｇ，１７Ｂの間の間隙１８に入射した光は、カラーフィルタ１７Ｒ，１７Ｇ，１７Ｂを透過しないために無着色光のまま液晶層２２を透過して補償容量電極１３により反射され、再び前記液晶層２２を透過して、そのうちの前面側偏光板２３の透過軸に沿った偏光成分の光が、この偏光板２３を透過して液晶表示素子１の前面に出射する。

【００８２】なお、前記液晶表示素子１においては、前記補償容量電極１３の延長部１３ｂの上をデータライン１２が通っているが、このデータライン１２は光の反射率が高い金属膜からなっているため、前記データライン１２部分に入射した光は、このデータライン１２で反射される。

【００８３】また、この実施例では、カラーフィルタ１７Ｒ，１７Ｇ，１７Ｂを画素電極４の幅よりも僅かに幅広に形成しているため、前記各画素領域の間の領域のうちの前記カラーフィルタ１７Ｒ，１７Ｇ，１７Ｂの縁部に対応する部分に入射した光は、カラーフィルタ１７Ｒ，１７Ｇ，１７Ｂと液晶層２２とを透過して補償容量電極１３により反射され、再び前記液晶層２２とカラーフィルタ１７Ｒ，１７Ｇ，１７Ｂとを透過して、そのうちの前面側偏光板２３の透過軸に沿った偏光成分の光が、この偏光板２３を透過して液晶表示素子１の前面に出射する。

【００８４】そして、これらの出射光のうち、各画素領域からの出射光の透過率は、画素電極４と対向電極２０との間に印加される駆動電界による液晶分子の配向状態の変化に応じて変化し、それにより、各画素領域から出射する赤、緑、青の着色光の強度が変化して、これらの着色光の組み合わせによりフルカラー画像が表示される。

【００８５】ただし、前記各画素領域からの出射光は、液晶表示素子１をその背面方向に透過する経路（往路）と前面方向に透過する経路（復路）とにおいて前記カラーフィルタ１７Ｒ，１７Ｇ，１７Ｂを二度透過した光であるため、入射した外光の強度に比べて、カラーフィルタ１７Ｒ，１７Ｇ，１７Ｂにより二度の吸収された強度の弱い着色光である。

【００８６】しかも、前記画素領域のうちの補償容量Ｃｓ部以外の領域では、液晶表示素子１にその前方から入射した光が再び液晶表示素子１の前面に出射するまでの間に、前面側偏光板２３と背面側偏光板２４とをそれぞれ２回ずつ透過するため、前記補償容量Ｃｓ部以外の画素領域からの出射光は、前記カラーフィルタ１７Ｒ，１７Ｇ，１７Ｂによる前述の二度の吸収に加えて、前面側偏光板２３および背面側偏光板２４による計４回の吸収をさらに受けた強度の弱い着色光である。

【００８７】なお、前面側偏光板２３および背面側偏光板２４による光の吸収は、液晶表示素子１にその前方から入射する外光が前面側偏光板２３を透過して直線偏光となるときが最も大きく（ほぼ１／２の光量が吸収される）、液晶表示素子１の背面に出射するときの背面側偏光板２４による吸収は、液晶層２２を透過した光の偏光状態によって変化し、また、照明手段３０の半透過反射板３２により反射された光が液晶表示素子１の前面に出射するときの背面側偏光板２４および前面側偏光板２３による吸収は僅かであるが、偏光板２３，２４による光の吸収が僅かでも増えると、その分出射光の強度が弱くなる。

【００８８】さらに、この実施例で用いた照明手段３０は、その前面の半透過反射板３２により光を反射させるものであり、この半透過反射板３２の反射率は通常の反射板に比べてかなり悪いため、前記補償容量Ｃｓ部以外の画素領域からの出射光の強度がさらに弱くなる。

【００８９】しかも、この無着色の出射光は、液晶表示素子１の背面側に出射することなく、背面側基板３の内面において前記補償容量電極１３により反射された光（ただし、データライン１２により反射された光を含む）であり、したがって、液晶表示素子１の背面に出射

し前記照明手段３０により反射されて前記液晶表示素子１にその背面から入射する経路での光の吸収を全く受けない、より強度の高い光である。

【００９０】ただし、前記前記画素領域のうちの補償容量Ｃｓ部からの出射光は、液晶表示素子１の背面側に出射することなく、背面側基板３の内面において前記補償容量電極１３により反射された光であり、したがって、液晶表示素子１の背面に出射し前記照明手段３０により反射されて前記液晶表示素子１にその背面から入射する経路での光の吸収を全く受けないから、この補償容量Ｃｓ部からの出射光は、前記補償容量Ｃｓ部以外の画素領域からの出射光よりはある程度強度の高い光である。

【００９１】また、前記液晶表示素子１にその前方から入射する外光は様々な入射角で入射するため、前記照明手段３０の半透過反射板３２により反射された光は、液晶表示素子１の前面から様々な出射角で出射するが、その光のうち、列方向において隣り合う画素領域の間の領域を透過して液晶表示素子１の前面に向かうた光は、前面側基板２の内面において前記遮光膜１６により遮られ、前記遮光膜１６が無い領域を透過した光だけが液晶表示素子１の前面に出射する。

【００９２】図４は、上記反射型表示のときの各画素領域およびその周囲からの出射光を示しており、反射型表示のときは、各画素領域のうちの補償容量Ｃｓ部以外の領域（図において点模様を施した領域のうちの二点鎖線で囲まれた領域）Ｓ１から強度の弱い着色光が出射し、各画素領域のうちの補償容量Ｃｓ部（図において点模様を施した領域のうちの二点鎖線より外側の領域）Ｓ２から前記補償容量Ｃｓ部以外の領域Ｓ１からの出射光よりはある程度強度の高い着色光が出射する。

【００９３】また、列方向および行方向において隣り合う画素領域の間の領域Ｓ３ａ，Ｓ３ｂのうち、列方向の画素間領域（図において平行斜線を施した領域）Ｓ３ａからは、光が遮光膜１６により遮られて出射せず、行方向の画素間領域Ｓ３ｂから充分強度の高い無着色光が出射する。

【００９４】そして、人間の目には、前記Ｓ１，Ｓ２の領域から出射する着色光と、その間の領域Ｓ３ａから出射する無着色光とが混ざって見えるため、観察される画像は、前記無着色光の強度分だけ明るさが増した赤、緑、青の着色光により表示される明るいフルカラー画像である。

【００９５】このように、外光を利用する反射型表示のときは、液晶表示素子１の各画素領域から出射する着色光は強度の弱い光であるが、各画素領域の間のカラーフィルタ１７Ｒ，１７Ｇ，１７Ｂ間の間隙１８に対応する領域から前記着色光よりも充分強度の高い無着色光が出射するため、この無着色光により画面全体の明るさを補い、画面の明るさが充分なフルカラー画像を表示することができる。

【００９６】次に、照明手段３０からの照明光を利用する透過型表示について説明すると、このときは、前記照明手段３０からの照明光が、図２に実線で示した経路のように液晶表示素子１にその背面から入射し、その光が、背面側偏光板２４によりその吸収軸に沿った偏光成分の光を吸収され、この背面側偏光板２４の透過軸に沿った直線偏光となって液晶層２２に入射する。

【００９７】なお、前記照明手段３０は、図示しない光源部からの光を導光板３１ａで導いてその前面から出射する前記照明パネル３１と、前記導光板３１ａの前面に設けられて半透過反射板３２とからなっており、前記半透過反射板３２は、その反射／透過率特性に応じて入射光を反射および透過させるため、この照明手段３０からの出射する照明光の輝度は光源部からの光の輝度に比べて低いが、前記光源部の発光輝度は充分高く設定されており、したがって、充分に高い輝度の照明光を液晶表示素子１に入射させることができる。

【００９８】そして、この液晶表示装置においては、前記液晶表示素子１の背面側基板３の内面に設けられた前記補償容量電極１３が光の反射率が高い金属膜からなっており、この補償容量電極１３が、行方向において隣り合う画素電極４，４間の領域に対向する延長部１３ｂを有する形状に形成されているため、透過型表示のときは、液晶表示素子１の背面から入射した照明光のうち、各画素領域のうちの補償容量Ｃｓ部と、行方向において隣り合う画素領域の間の領域のうちの前記補償容量電極１３が対向している部分とに入射した光が、背面側基板３の内面において前記補償容量電極１３により遮られる。

【００９９】したがって、透過型表示のときは、各画素領域のうちの補償容量Ｃｓ部および隣り合う画素電極４，４間の補償容量電極１３が対向する領域とを除く他の領域に入射した光だけが液晶層２２に入射し、この液晶層２２に入射した光が、カラーフィルタ１７Ｒ，１７Ｇ，１７Ｂを透過して着色光となり、そのうちの前面側偏光板２３の透過軸に沿った偏光成分の光が、この偏光板２３を透過して液晶表示素子１の前面に出射する。

【０１００】このとき、前面側基板２の内面に列方向において隣り合う画素電極４，４間の領域およびＴＦＴ５部分の全体に対向させて設けられている遮光膜１６に入射した光はこの遮光膜１６により遮られ、前記遮光膜１６が無い領域を透過した光だけが液晶表示素子１の前面に出射する。

【０１０１】この透過型表示のときは、前記照明光の輝度が高く、また、液晶表示素子１の背面から入射した光がこの液晶表示素子１をその前面に向かって透過するだけであるため、前記カラーフィルタ１７Ｒ，１７Ｇ，１７Ｂによる光の吸収と、背面側偏光板２４および前面側偏光板２３による光の吸収はそれぞれ一度ずつだけであり、したがって、出射する着色光の強度は充分高いか

ら、充分な明るさのフルカラー画像が表示される。

【０１０２】図５は、上記透過型表示のときの各画素領域からの出射光を示しており、透過型表示のときは、各領域のうちの各画素領域のうちの補償容量Ｃｓ部以外の領域（図４における点模様を施した領域のうちの二点鎖線で囲まれた領域と同じ領域）Ｓ１から充分な強度の着色光が出射し、その周囲の平行斜線を施した領域（図４における点模様を施した領域のうちの二点鎖線より外側の領域Ｓ２と、列方向および行方向において隣り合う画素領域の間の領域Ｓ３ａ，Ｓ３ｂとの全ての領域）Ｓ４からは、光が補償容量電極１３および遮光膜１６の一方または両方により遮られて出射しない。

【０１０３】このように、透過型表示のときは、液晶表示素子１にその背面から入射する照明光のうち、前記各画素領域のうちの補償容量部と、行方向において隣り合う画素領域の間の前記補償容量電極１３が対向している部分とに入射した光が前記補償容量電極１３により遮られ、また、前記液晶表示素子１を透過した光のうち、列方向において隣り合う画素領域の間の領域を透過した光が前記遮光膜１６で遮られるため、各画素領域の周囲からの光の漏れはほとんど無く、したがって、黒表示状態の輝度を低下させることができるので、明るさもコントラストも充分なフルカラー画像を表示することができる。

【０１０４】このため、上記液晶表示装置によれば、外光を利用する反射型表示のときは、画面の明るさが充分なフルカラー画像を表示し、照明手段３０からの照明光を利用する透過型表示のときは、明るさもコントラストも充分なフルカラー画像を表示することができる

また、上記実施例では、液晶表示素子１の前面側基板２の内面に設けたカラーフィルタ１７Ｒ，１７Ｇ，１７Ｂを、画素電極４全体を覆うように形成し、これらのカラーフィルタ１７Ｒ，１７Ｇ，１７Ｂの間の間隙１８を、前記補償容量電極１３の延長部１３ｂの幅よりも小さく設定しているため、画素電極４と対向電極２０とが互いに対向する画素領域からの出射光の全てが着色光になるから、前記画素領域からの出射光で表示されるフルカラー画素の色度を充分に確保することができ、また、前記カラーフィルタ１７Ｒ，１７Ｇ，１７Ｂの間の間隙１８が補償容量電極１３の延長部１３ｂの幅よりも小さければ、前記補償容量電極１３とカラーフィルタ１７Ｒ，１７Ｇ，１７Ｂとの間から光が漏れることがないため、上記透過型表示におけるコントラストをより良くすることができる。

【０１０５】しかも、上記実施例では、前記カラーフィルタ１７Ｒ，１７Ｇ，１７Ｂの間の間隙１８を、ほぼ４μｍ以上に設定しているため、上記反射型表示のときに、行方向において隣り合う画素領域の間から、ほぼ４μｍ以上の幅で無着色光を出射して、表示をより充分に明るくすることができる。

【０１０６】また、上記実施例では、前記補償容量電極１３を、画素電極４の一端縁部に対向するライン部１３ａと、このライン部１３ａの一側縁から前記画素電極４の両側縁部に沿ってそれぞれ延びる延長部１３ｂとからなり、前記延長部１３ｂが、行方向において隣り合う画素電極４，４間の領域に対向する形状に形成しているため、上記反射型表示のときに、少なくとも各画素領域の両側から無着色光を出射させて、より画面を明るくすることができるとともに、透過型表示のときは、少なくとも前記画素領域の両側からの光の漏れを無くして、良好なコントラストを得ることができる。

【０１０７】さらに、上記実施例では、液晶表示素子１の前面側基板２の内面に、各画素電極３の両端側の電極間領域、つまり列方向において隣り合う画素電極４，４間の領域それぞれ対応する遮光膜１６を設け、背面側基板３の内面に設けた前記補償容量電極１３の前記延長部１３ｂを、前記遮光膜１６の無い領域全体に対応させているため、各画素領域の周囲からの光の漏れをほぼ完全に無くして、上記透過型表示におけるコントラストをより高くすることができる。

【０１０８】なお、上記実施例で用いた液晶表示素子１は、補償容量電極１３を、ＴＦＴ５にゲート信号を供給するためのゲートライン１１とは別に設けて、いわゆる蓄積容量方式の補償容量Ｃｓを形成したものであるが、前記補償容量Ｃｓは、前記補償容量電極１３を前記ゲートライン１１と一体の電極とした、いわゆる付加容量方式としてもよい。

【０１０９】また、上記実施例では、液晶表示素子１の前面側基板２の内面に設けるカラーフィルタ１７Ｒ，１７Ｇ，１７Ｂを、各画素電極列の全ての画素電極４に対応するストライプ状フィルタとしたが、これらのカラーフィルタ１７Ｒ，１７Ｇ，１７Ｂは、行方向および列方向に配列する各画素電極４ごとに対向させて形成してもよい。

【０１１０】図６はこの発明の第２の実施例を示す液晶表示素子の一部分の正面図であり、この実施例は、補償容量Ｃｓを付加容量方式とし、また、赤、緑、青の各色のカラーフィルタ１７Ｒ，１７Ｇ，１７Ｂを、行方向および列方向に配列する各画素電極４ごとに対向させて形成したものである。

【０１１１】すなわち、この実施例では、図６に示したように、補償容量電極１３をゲートライン１１と一体の電極とし、各画素電極４に対応する補償容量Ｃｓを、付加容量方式の容量としている。

【０１１２】また、この実施例では、赤、緑、青の各色のカラーフィルタ１７Ｒ，１７Ｇ，１７Ｂを、行方向および列方向に配列する各画素電極４ごとに対向させて形成し、行方向において隣り合うカラーフィルタ１７Ｒ，１７Ｇ，１７Ｂの間に、前記補償容量電極１３の延長部１３ｂに対応する間隙１８を形成するとともに、列方向

において隣り合うカラーフィルタ１７Ｒ，１７Ｇ，１７Ｂの間にも間隙１８ａを形成している。

【０１１３】この実施例において、前記カラーフィルタ１７Ｒ，１７Ｇ，１７Ｂは、その横幅および縦幅の両方が前記画素電極４よりも僅かに大きい形状に形成されており、また、列方向において隣り合うカラーフィルタ１７Ｒ，１７Ｇ，１７Ｂの間の間隙１８ａは、その幅の大部分または全幅が前記補償容量電極１３のライン部（ゲートライン１１と一体の部分）１３ａに対応するように設定されている。

【０１１４】そして、この実施例では、液晶表示素子１の前面側基板２の内面に設けた遮光膜１６を、その一側縁部（図６において上縁部）が、列方向において隣り合う一方の画素電極４のＴＦＴ接続側の端縁部に対向し、他側縁部（図６において下縁部）と他方の画素電極４に対応するカラーフィルタ１７Ｒ，１７Ｇ，１７Ｂの縁部との間に僅かな間隙を有する幅に形成している。

【０１１５】なお、この液晶表示素子１は、補償容量電極１３が付加容量方式であり、またカラーフィルタ１７Ｒ，１７Ｇ，１７Ｂを行方向および列方向に配列する各画素電極４ごとに対向させて形成するとともに、遮光膜１６を上記のような幅に形成したものであるが、その他の構成は上述した第１の実施例で用いた液晶表示素子１と同じであるから、重複する説明は図に同符号を付して省略する。また、この実施例でも、前記液晶表示素子１の背後に、第１の実施例で用いた照明手段３０と同じ照明手段を配置している。

【０１１６】この実施例によれば、カラーフィルタ１７Ｒ，１７Ｇ，１７Ｂを行方向および列方向に配列する各画素電極４ごとに対向させて形成し、行方向において隣り合うカラーフィルタ１７Ｒ，１７Ｇ，１７Ｂの間と、列方向において隣り合うカラーフィルタ１７Ｒ，１７Ｇ，１７Ｂの間とに、光の反射率が高い金属膜からなる補償容量電極１３に対応する間隙１８，１８ａを形成し、さらに前記遮光膜１６を、列方向において隣り合う画素電極４のうちの片方の画素電極４に対応するカラーフィルタ１７Ｒ，１７Ｇ，１７Ｂの縁部との間に僅かな間隙を有する幅に形成しているため、外光を利用する反射型表示のときに、行方向において隣り合う画素領域の間の領域からだけでなく、列方向において隣り合う画素領域の間のカラーフィルタ１７Ｒ，１７Ｇ，１７Ｂと遮光膜１６との間隙からも、充分強度の高い無着色光が出射する。

【０１１７】すなわち、図７は、この実施例の場合の反射型表示のときの各画素領域およびその周囲からの出射光を示しており、反射型表示のときは、各画素領域のうちの補償容量Ｃｓ部以外の領域（図において点模様を施した領域のうちの二点鎖線で囲まれた領域）Ｓ１から、液晶表示素子１の背後の照明手段３０により反射された強度の弱い着色光が出射し、各画素領域のうちの補償容量Ｃｓ部（図において点模様を施した領域のうちの二点鎖線より外側の領域）Ｓ２から、液晶表示素子１の背面側基板３の内面において補償容量電極１６により反射された、前記補償容量Ｃｓ部以外の領域Ｓ１からの出射光よりある程度強度の高い着色光が出射する。

【０１１８】なお、この実施例では、前記遮光膜１６を、列方向において隣り合う画素電極４のうちの片方の画素電極４に対応するカラーフィルタ１７Ｒ，１７Ｇ，１７Ｂの縁部との間に僅かな間隙を有する幅に形成しているため、前記補償容量Ｃｓ部Ｓ２のうちの画素領域の一端縁に対応する領域からの着色光の出射幅は上述した第１の実施例の場合よりも広い。

【０１１９】また、列方向において隣り合う画素領域の間の領域は、前記遮光膜１６に対応する領域（図において平行斜線を施した領域）Ｓ３ａと、前記遮光膜１６とカラーフィルタ１７Ｒ，１７Ｇ，１７Ｂの縁部との間の間隙に対応する領域Ｓ３ｃとを含んでおり、これらの領域Ｓ３ａ，Ｓ３ｃのうち、前記遮光膜１６に対応する領域Ｓ３ａからは、光が遮光膜１６により遮られて出射せず、また遮光膜１６とカラーフィルタ１７Ｒ，１７Ｇ，１７Ｂの縁部との間の間隙に対応する領域Ｓ３ｃからは、カラーフィルタ１７Ｒ，１７Ｇ，１７Ｂにより吸収がなく、しかも液晶表示素子１の背面側基板３の内面において補償容量電極１３により反射された、充分強度の高い無着色光が出射する。

【０１２０】さらに、行方向において隣り合う画素領域の間の領域Ｓ３ｂからは、カラーフィルタ１７Ｒ，１７Ｇ，１７Ｂにより吸収がなく、しかも液晶表示素子１の背面側基板３の内面において補償容量電極１３により反射された、充分強度の高い無着色光が出射する。

【０１２１】このように、この実施例によれば、外光を利用する反射型表示のときに、行方向において隣り合う画素領域の間の領域からだけでなく、列方向において隣り合う画素領域の間のカラーフィルタ１７Ｒ，１７Ｇ，１７Ｂと遮光膜１６との間隙からも、充分強度の高い無着色光が出射するため、第１の実施例の場合よりも、さらに明るいフルカラー画像を表示することができる。

【０１２２】また、図７はこの実施例の場合の透過型表示のときの各画素領域からの出射光を示しており、この実施例においても、照明手段３０からの照明光を利用する透過型表示のときは、第１の実施例と同様に、各領域のうちの各画素領域のうちの補償容量Ｃｓ部以外の領域（図７における点模様を施した領域のうちの二点鎖線で囲まれた領域と同じ領域）Ｓ１から充分な強度の着色光が出射し、その周囲の平行斜線を施した領域（図７における点模様を施した領域のうちの二点鎖線より外側の領域Ｓ２と、列方向および行方向において隣り合う画素領域の間の領域Ｓ３ａ，Ｓ３ｃおよびｓ１ｂとの全ての領域）Ｓ４からは、光が補償容量電極１３および遮光膜１６の一方または両方により遮られて出射しない。

【０１２３】このため、透過型表示のときは、各画素領域の周囲からの光の漏れはほとんど無く、したがって、明るさもコントラストも充分なフルカラー画像を表示することができる。

【０１２４】なお、上記第１および第２の実施例で用いた液晶表示素子１は、各画素電極４を、行方向および列方向にそれぞれ直線状に並べて配列した、いわゆる格子状配列型のものであるが、液晶表示素子は、各画素電極および各色のカラーフィルタを、行方向には交互に並べて直線状に配列し、列方向には同色の画素を表示するための画素電極およびカラーフィルタ同士を約１．５ピッチずつ行方向に交互にずらしてジグザグに配列した、いわゆるデルタ配列（モザイク配列とも言う）型のものでもよい。

【０１２５】また、上記実施例では、照明手段３０として、サイドライト型照明パネル３１の前面に半透過反射板３２を配置したものを用いたが、液晶表示素子１の背後に配置する照明手段は、例えば平成９年特許願第３５３６０３号の明細書および図面に記載された、理論的には光源部からの光を１００％出射し、前方からの入射光を１００％反射するものでもよい。

【０１２６】このような照明手段を用いれば、光源部からの光を高い効率で照明光として出射することができるとともに、前方からの入射光も高い反射率で反射することができるため、前記光源部の発光輝度を比較的低く設定し、少ない消費電力で充分に明るい透過型表示を行なうとともに、外光を利用する反射型表示を、上記第１および第２の実施例よりもさらに明るくすることができる。

【０１２７】さらに、上記実施例で用いた液晶表示素子１は、各画素電極４にそれぞれ対応する着色膜として、赤、緑、青の三色のカラーフィルタ１７Ｒ，１７Ｇ，１７Ｂを備えたものであるが、前記着色膜は、赤、緑、青の三色のカラーフィルタ１７Ｒ，１７Ｇ，１７Ｂに限られるものではなく、また、前記着色膜は、液晶表示素子１の背面側基板３の内面に設けてもよい。

【０１２８】

【発明の効果】この発明は、液晶表示素子の背後に、照明光を前記液晶表示素子に向けて出射するとともに、前記液晶表示素子の前方から入射する外光を前記液晶表示素子に向けて反射する照明手段を配置した２ウエイ液晶表示装置において、前記液晶表示素子を、その背面側基板の内面に、複数の画素電極と、ＴＦＴと、ゲートラインおよびデータラインと、補償容量電極とが設けられ、前面側基板の内面に対向電極が設けられるとともに、前記一対の基板のいずれか一方の内面に、複数の色の着色膜が前記各画素電極にそれぞれ対応させて設けられるとともに、前記補償容量電極が光の反射率が高い金属膜からなっており、この補償容量電極が、隣り合う画素電極間の領域に対向する延長部を有する形状に形成され、前記各画素電極にそれぞれ対応する前記複数の色の着色膜の間に、前記補償容量電極の前記延長部に対応する間隙が形成され、前方から入射した光のうち、前記着色膜間の間隙を透過して前記補償容量電極で反射される光が無着色光のまま前方に出射する構成としたものであるから、外光を利用する反射型表示のときは、画面の明るさが充分なカラー画像を表示し、照明手段からの照明光を利用する透過型表示のときは、明るさもコントラストも充分なカラー画像を表示することができる。

【０１２９】この発明の液晶表示装置において、前記着色膜を、透明導電膜からなる前記画素電極全体を覆うように形成し、前記着色膜間の間隙を、前記補償容量電極の前記延長部の幅よりも小さく設定すれば、画素電極と対向電極とが互いに対向する画素領域からの出射光の全てが着色光になるため、前記画素領域からの出射光で表示されるカラー画素の色度を充分に確保することができ、また、前記着色膜間の間隙が前記補償容量電極の延長部の幅よりも小さければ、前記補償容量電極と着色膜との間から光が漏れることがないため、前記透過型表示におけるコントラストをより良くすることができる。

【０１３０】また、前記補償容量電極は、前記画素電極の一端縁部に対向するライン部と、このライン部の一側縁から前記画素電極の両側縁部に沿ってそれぞれ延びる延長部とからなり、前記延長部が、前記隣り合う画素電極間の領域に対向する形状に形成するのが好ましく、前記補償容量電極をこのような形状に形成すれば、反射型表示のときに、少なくとも前記画素領域の両側から無着色光を出射させて、より画面を明るくすることができるとともに、透過型表示のときは、少なくとも前記画素領域の両側からの光の漏れを無くして、良好なコントラストを得ることができる。

【０１３１】さらに、この発明の液晶表示装置において、前記液晶表示素子の前面側基板の内面に、前記各画素電極の両端側の電極間領域にそれぞれ対応する遮光膜を設け、前記補償容量電極の前記延長部を、前記遮光膜の無い領域全体に対応させれば、各画素領域の周囲からの光の漏れをほぼ完全に無くして、黒表示状態の輝度を小さくできるので、透過型表示におけるコントラストをより高くすることができる。

【図面の簡単な説明】

【図１】この発明の第１の実施例を示す、液晶表示装置に用いた液晶表示素子の一部分の正面図。

【図２】図１のII－II線に沿う液晶表示装置の断面図。

【図３】図１の III－III 線に沿う液晶表示装置の断面図。

【図４】第１の実施例における反射型表示のときの各画素領域およびその周囲からの出射光を示す図。

【図５】第１の実施例における透過型表示のときの各画素領域からの出射光を示す図。

【図６】この発明の第２の実施例を示す、液晶表示装置

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に用いた液晶表示素子の一部分の正面図。

【図７】第２の実施例における反射型表示のときの各画素領域およびその周囲からの出射光を示す図。

【図８】第２の実施例における透過型表示のときの各画素領域からの出射光を示す図。

【符号の説明】

１…液晶表示素子

２，３…基板

４…画素電極

５…ＴＦＴ

１１…ゲートライン

１２…データライン

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１３…補償容量電極

１３ａ…ライン部

１３ｂ…延長部

１６…遮光膜

１７Ｒ，１７Ｇ，１７Ｂ…カラーフィルタ

１８，１８ａ…カラーフィルタ間の間隙

２０…対向電極

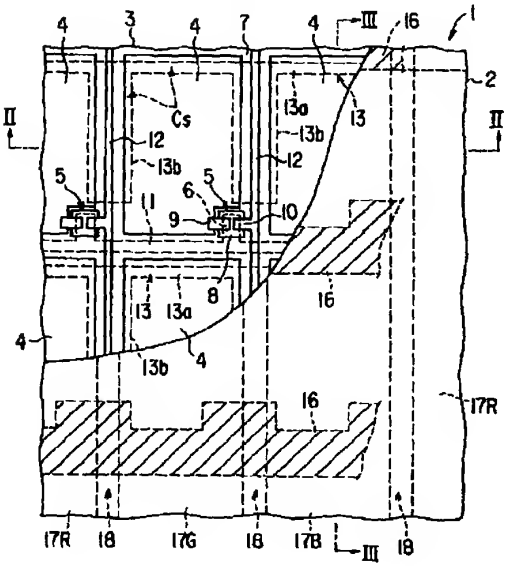
２３，２４…偏光板

３０…照明手段

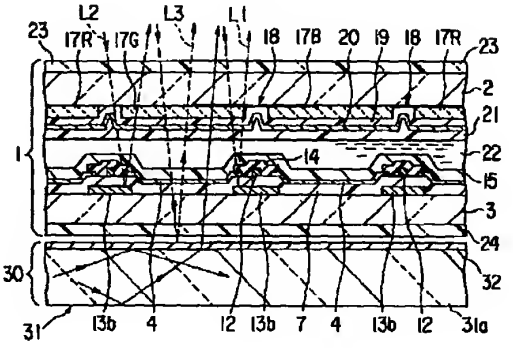
３１…照明パネル

３２…半透過反射板

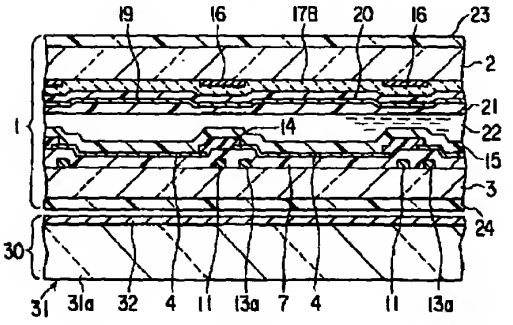
【図１】



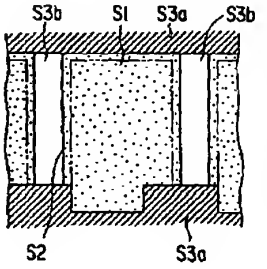
【図２】



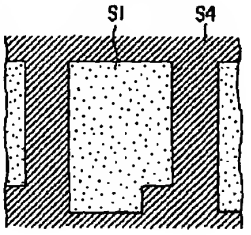
【図３】



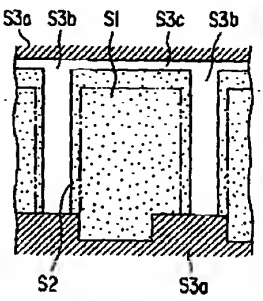
【図４】



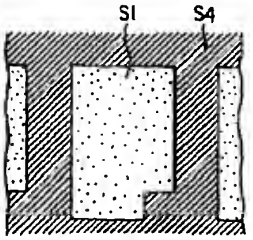
【図５】



【図７】



【図８】



【図６】